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Contents—August, 1954

Volume XXXV No. 8

ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION

(Formerly Archives of Physical Medicine)

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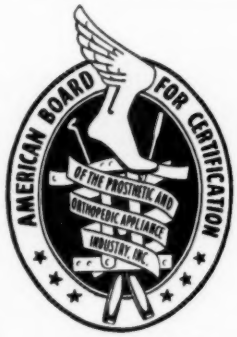

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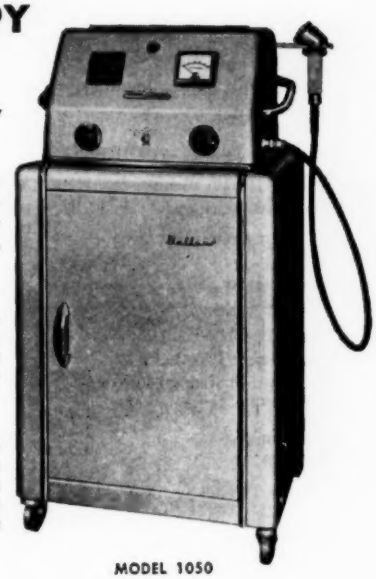

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The Influence of Electric Stimulation on the Course of Denervation Atrophy

Dale V. Shaffer, B.S.
Gordon K. Branes, B.A.
Khalil G. Wakim, M.D.
George P. Sayre, M.D.
and
Frank H. Krusen, M.D.
Rochester, Minn.

Many of the problems encountered by physiatrists are concerned with denervated skeletal muscle and the prevention of its atrophy. The treatment of denervated muscles must be continued for many months. It is the responsibility of those concerned with rehabilitation to delay or prevent the wasting of muscle substance and to maintain the muscles in such a state that, should reinnervation occur, functional recovery would be more rapid and more complete. One of the methods used to prevent the atrophy of denervation has been intermittent electric stimulation. This investigation was undertaken to obtain a more definite understanding of the role of electric stimulation in the retardation of the atrophy produced by denervation.

The work of Reid[1] on the frog showed that the muscles of the denervated stimulated limb retain their original size and contract vigorously while those of the opposite denervated but unstimulated limb atrophy to half their size and contract feebly. Brown-Séquard[2] confirmed this work. Langley[3], however, concluded that electric stimulation has no definite effect in delaying the loss of weight of denervated muscles. Hartman and Blatz[4] stimulated the hind leg muscles of rabbits daily for 2 to 20 minutes and concluded that galvanic stimulation is of no benefit to denervated muscle. Hines and Knowlton[5] stimulated the denervated gastrocnemius muscle of the rat continuously for 120 hours at a rate of one stimulus per second. The rate of atrophy was not influenced. The work of Chor and associates[6] has indicated that the denervated stimulated limb in monkeys atrophies to a greater extent than the opposite denervated, unstimulated limb. Doupe and associates[7] stated that the only value of electric stimulation in denervation atrophy is as an aid to muscle re-education.

In spite of these conflicting ideas, much evidence does exist for the conclusion that loss of weight of denervated skeletal muscle is retarded by electric stimulation. The major findings of the work of Fischer[8], Gutmann and Guttmann[9,10], Osborne and associates[11,12], Hines and co-workers[13,14], Hajek and Hines[15], Bowden[16], Jackson[17], Kosman, Osborne, and Ivy[18-20], and Solandt and co-workers[21] can be summarized as follows: 1. Atrophy can be retarded by means of electric stimulation; 2. to be most effective, stimulation must be started as soon as possible after denervation; 3. frequency of treatment rather than duration of treatment is the major critical factor, and 4. a vigorous contraction is necessary for obtaining the most beneficial effects.

A wide variety of technics and electric current forms were used in the foregoing studies.

Methods

The hind legs of adult albino rats (200 to 300 gm. body weight) were denervated by excision of a segment of the sciatic nerve at the level of the

Read at the Thirty-first Annual Session of the American Congress of Physical Medicine and Rehabilitation, Chicago, September 3, 1953.
Fellow in Physiology, Mayo Foundation;
Fellow in Physiology, Mayo Foundation;
Section of Physiology, Mayo Clinic;
Section of Pathologic Anatomy, Mayo Clinic;
Section of Physical Medicine and Rehabilitation, Mayo Clinic, Rochester, Minn.

greater trochanter of the femur and of the femoral nerve in the femoral triangle at the base of the thigh. The stimulated animals in each group were given daily two sessions of stimulation lasting fifteen minutes each. The animals were classified into groups as follows:

Group I. Unilateral denervation; one hind extremity of each animal in this group was denervated as described in the preceding paragraph. The contralateral limb was left intact as a control. Resistance and tension were applied to the denervated extremity throughout the period of stimulation. Stimulation of the denervated extremity was started on the day after denervation with the limb stretched and made to contract against a resistance. There were twenty-seven animals in this group.

Group II. This group was prepared and treated in the same manner as Group I, but no tension and no resistance were applied to the denervated extremity during the period of stimulation. There were twenty-seven animals in this group.

Group III. Unilateral denervation; stimulation of the denervated extremity was delayed for 10 days after denervation. The limb was stretched and made to contract against resistance during stimulation. There were 14 animals in this group.

Group IV. Bilateral denervation; stimulation of one extremity was started the day after denervation with the limb under stretch and made to contract against a resistance. The contralateral limb served as the denervated unstimulated control. There were 21 animals in this group.

Group V (Control). Unilateral denervation; no stimulation. There were 65 animals in this group.

Similarly, the left hind legs of 4 dogs were denervated under aseptic conditions. The gastrocnemius, plantaris, and tibialis anterior muscles of 2 dogs were subjected to electric stimulation for periods of 15 minutes twice daily for 60 days. Tension and resistance were applied manually to the stimulated limb. Two dogs served as the denervated, unstimulated controls.

The electronic stimulator designed by Eberbach, Son and Co., was used for stimulation in this study. This instrument delivers a square-wave type of current of roughly 1 millisecond duration. The intensity was gauged to give maximal contractions. Tension on the muscles was applied by means of a loop of rubber tubing through which the foot was passed and secured with a rubber band. This band served as the resistance against which the muscles had to pull. The electrodes were fastened to the shaved skin with collodion, one near the ankle and the other higher up on the thigh. The position of the electrodes was varied slightly from day to day to avoid irritation of the skin. Electrode jelly was placed under the electrodes to decrease the skin resistance and facilitate conduction.

The denervated extremities which were stimulated were treated for 5, 10, 15, 20, 23, 25 and 30 days respectively, to determine when and for how long electric stimulation was of value in delaying the loss of weight of denervated muscle. At the end of each experimental period, the animals were killed under ether anesthesia. The hind limbs were dissected and the gastrocnemius, plantaris, and tibialis anterior muscles were carefully isolated and immediately weighed.

Longitudinal and cross sections of muscle tissue were taken for histologic examination from the gastrocnemius muscle of 2 treated and 2 untreated animals for each experimental period in the various groups. Ten representative fields were examined microscopically from the unilaterally denervated animals and 30 fields were examined from the bilaterally denervated animals. The number of nuclei and the number of fibers were counted in each area and the size of the muscle fibers was measured.

Experimental Results

Electric stimulation was most effective in maintaining muscle substance and in retarding loss of weight when the limb was stretched and the muscles were made to work against resistance. In Group I, where stimulation was started the day after denervation, the gastrocnemius muscle exhibited the least percentage of loss of weight. There was a greater loss of weight for the plantaris muscle and a still greater loss of weight for the tibialis anterior muscle. After 25 days, the percentage of loss of weight of the denervated stimulated gastrocnemii was 44 per cent, while the denervated unstimulated gastrocnemii demonstrated a 62 per cent reduction of weight as compared with the weight of the normal muscle in the intact contralateral limb.

The muscles which were stimulated without tension and resistance (Group II) showed a negligible degree of retardation of loss of weight after 25 days (fig. 1). In this instance, the stimulated gastrocnemii showed a 61 per cent loss of weight as compared with the unstimulated denervated muscles (Group V), which atrophied to the extent of 62 per cent as compared with the intact contralateral muscle. There was significant retardation of loss of weight in Group II from the 10th to the 15th day. After that, atrophy proceeded at an increased rate despite continued electric stimulation.

Where stimulation was delayed for 10 days after denervation (Group III), the stimulated gastrocnemii at the end of 23 days showed 44 per cent loss of weight whereas the unstimulated muscles had lost 62 per cent of their weight.

The effect of electric stimulation in preventing loss of weight due to complete denervation was more clearly evident in the bilaterally denervated group (Group IV). After 15 days there was a difference of 37 per cent in the weights of stimulated and unstimulated gastrocnemii muscles. The stimulated muscles were heavier (fig. 2). The corresponding difference was 30 per cent for the plantaris muscles and 16 per cent for the tibialis anterior muscles.

In general, the maximal beneficial effect of electric stimulation was reached between 10 and 20 days. Thereafter the muscles began to show an increased loss of weight in spite of contin-

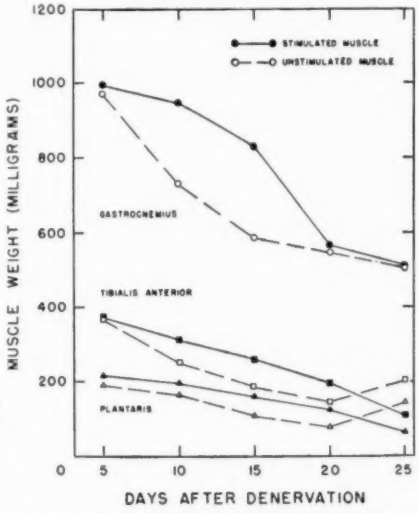

Fig. 1 — The influence of electric stimulation in the absence of tension and resistance upon the atrophy of denervation.

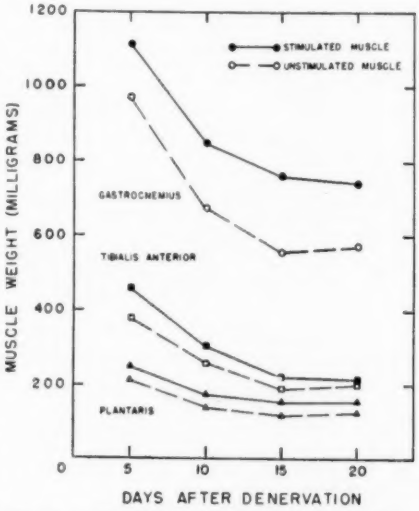

Fig. 2 — The influence of electric stimulation in the presence of tension and resistance upon the atrophy of denervation following bilateral denervation (Group IV).

uance of daily electric stimulation. However, the loss of weight was not as marked as that of the denervated unstimulated control in the rat.

In the dogs, at the end of 60 days, the denervated stimulated muscles appeared darker red than the denervated unstimulated muscles. There was no essential difference between the loss of weight of denervated stimulated gastrocnemius muscle (41 per cent) and that of the denervated unstimulated gastrocnemius muscle (40 per cent).

Histologic data from bilaterally denervated animals revealed 11 per cent fewer nuclei per unit area in stimulated muscle after 10 days than in the denervated unstimulated muscle. At the period of maximal retardation of loss of weight (15 days) there was the greatest reduction in the number of nuclei of denervated stimulated muscle amounting to 16 per cent when compared with the denervated unstimulated muscle. At the end of a 20 day period, the number of nuclei was greatly increased in denervated stimulated muscle (fig. 3).

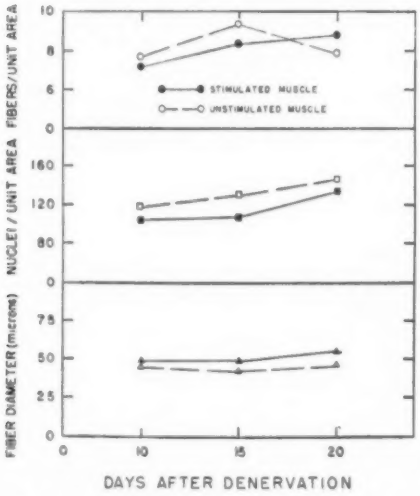

Fig. 3 — The influence of electric stimulation upon the fiber diameter and upon the number of fibers and the number of nuclei per unit area in denervated muscle.

For the first 15 days following denervation, the denervated stimulated muscle showed fewer fibers per unit area (8.4) than did the denervated unstimulated muscle (9.6). This was taken as evidence that the fibers of the stimulated muscles were larger than those of the unstimulated muscles. Furthermore, the diameters of the individual muscle fibers were actually found to be larger in those denervated muscles which had received electric stimulation (49 microns average diameter) than in those denervated muscles which were not stimulated (44 microns average diameter).

Histologic data from the dogs revealed a negligible difference in the number of nuclei and fibers per unit area and in the fiber diameters of denervated stimulated muscle when compared to the denervated unstimulated muscle.

Comment

All three muscles studied, the gastrocnemius, plantaris, and tibialis anterior muscle, did not show the same degree of atrophy nor the same degree of retardation of loss of weight. This may be due to (1) the fact that the gastrocnemius muscle lies more superficial than the plantaris muscle and has probably been more effectively stimulated. This statement is in accord with the observations of Gutmann and Guttmann[9], who found that the more superficial muscle showed greater effects of stimulation, and (2) the fact that with the method employed it was impossible to place the tibialis anterior muscle under equal tension and resistance with the other muscles studied. A better result might therefore be expected if those muscles antagonistic to each other were to be stimulated independently rather than as a whole.

Our results have shown that electric stimulation as used in this study (15 minutes twice daily with intensity sufficient for vigorous contractions) can delay the loss of weight of denervated skeletal muscle. Retardation of loss of weight in denervated muscle is enhanced under conditions of stretch and load. This is in agreement with the work of Kosman and associates[20], who stated that the prevention of atrophy

is greater when the muscle is maintained in a stretched position. We are also in agreement with the work of Hines and associates[14], who caused the muscles of their experimental animals to contract against a load (50 gm.) and found that intensity sufficient to produce strong contractions delayed atrophy. Our data revealed that the effect of electric stimulation in retarding loss of weight of denervated muscle was noted earlier than had been reported by Gutmann and Guttmann[8]. These authors stated that electrotherapy did not prevent atrophy for the first 2 weeks, and the earliest difference between stimulated and unstimulated muscle appeared on the 10th to 14th day. Our work demonstrated, particularly in the bilaterally denervated animals, that retardation of loss of weight was observed as early as 5 days following denervation.

The results of that group of animals in which stimulation had been delayed for 10 days (Group III) would appear to indicate that a brief delay would not be deleterious. Such a conclusion cannot be made with certainty on the basis of this study, since the first 10 days of stimulation have been found to be of value and since it has not been the purpose of this paper to determine whether muscle substance lost by denervation atrophy before beginning stimulation can be regained by such stimulation. At least one worker, Osborne[12], has reported that atrophy occurring before stimulation was not reversed.

Our work indicates that electric stimulation cannot retard loss of weight of muscle in denervation atrophy indefinitely. The data showed that, in stimulated muscles, the interval from 15 to 20 days was the period of minimal loss of weight of muscle.

From the small number of dogs included in this study it is impossible to make any conclusions with respect to the influence of electric stimulation upon the atrophy of denervation in this animal. The fact that the denervated unstimulated muscles were quite pale when compared with the deep-red color of the stimulated muscles may have been due solely to the influence of electric stimulation upon the state of nutrition of these latter muscles.

In reviewing the histologic changes in the denervated muscles, whether stimulated or not, there were noted the

Fig. 4 — Ten days after denervation, electric stimulation was begun and continued for 10 days. The muscle fibers in this area appear nearly normal. There is some variation in the size of the fiber and one collection of pyknotic nuclei. The cross striations are prominent (x200).

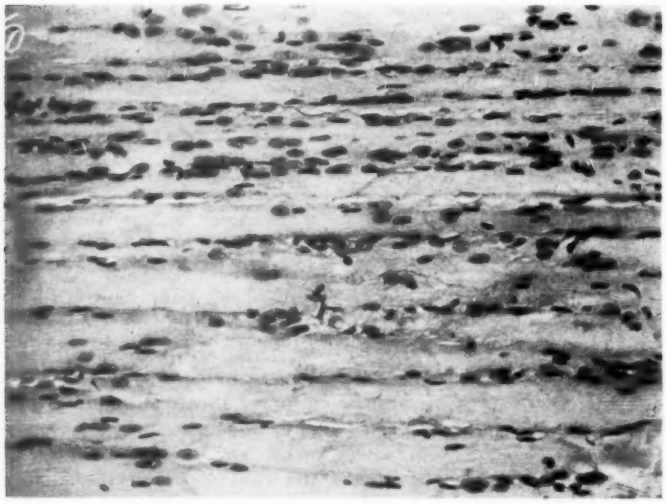

Fig. 5 — Immediately after denervation, stimulation was started and continued for 25 days. The muscle fibers have undergone atrophy with considerable variation in the size of the fibers and with an increase in the subsarcolemmal nuclei. There is preservation of the cross striations in most of the muscle fibers. Although some of the nuclei are present beneath the sarcolemma, others appear to have migrated into the substance of the muscle (x200).

general changes previously described in experimentally atrophied muscles[22]. These consisted of a progressive narrowing of the muscle fibers associated with an increase in subsarcolemmal nuclei, many of which have become rounded and clear, and appear to have migrated into the substance of the muscle fiber (figs. 4 and 5). The degree of atrophy varied considerably in individual muscle fibers within the same fasciculus and even within the same fiber. However, it was more striking between fibers in different areas of the histologic section. More interesting still was the finding, previously described by Adams and associates, of varying degrees of atrophy of the muscle fibers in different parts of the muscle such as occurred on each side of the tendinous insertion (fig. 6) where there was marked atrophy on one side and only slight atrophy on the other, in spite of the fact that the sciatic nerve had been completely severed in the sciatic notch. Finally, the finding of degenerated muscle fibers where there was swelling of the cytoplasm with hyalinization and vacuolization associated with a cellular infiltration was fairly common (fig. 7). Such degenerated fibers appeared in scattered areas and were unrelated to the degree of atrophy or the type of therapy used.

Histologic observations indicated that the increase in the number of muscular nuclei per unit area in denervation is lessened to some extent by electric stimulation. The same can be said for the relative increase in number of fibers per unit area. Gutmann and Guttmann[10] and Bowden[18] have reported a greater fiber diameter in stimulated muscle than in unstimulated muscle, and our findings corroborate this observation. Such observations are not evident when, after a period of maximal retardation of loss of weight atrophy continues at an increasing rate despite stimulation.

It must be stated that in the unilaterally denervated rat, the course of denervation atrophy as evidenced by the histologic findings was consistently irregular. In general, however, it could be noted that the trend was for the denervated stimulated muscles to have

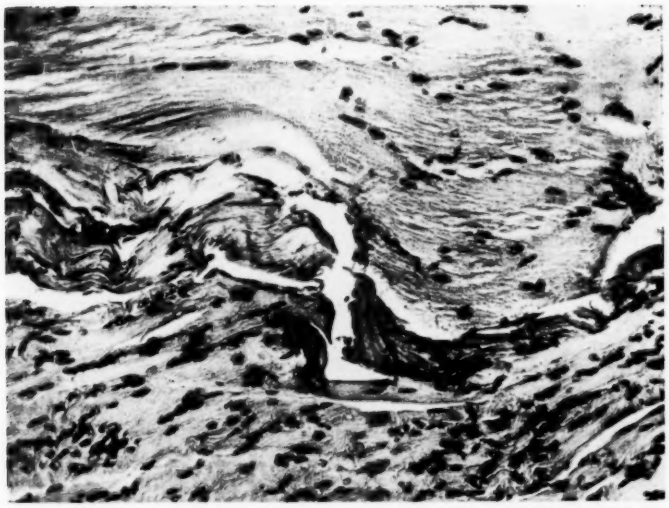

Fig. 6 — Immediately after denervation, stimulation was started and continued for 30 days. A tendinous septum separates a group of muscle fibers which shows little evidence of atrophy from a group which shows marked atrophy with narrowed fibers and an increase in subscarcolemmal nuclei. Many nuclei are rounded and pyknotic. The cross striations of the muscle fibers are still maintained (x200).

fewer nuclei and larger fibers than the denervated unstimulated muscles. This trend was not convincingly observed in the dogs studied.

It should be kept in mind that there are several sources of error in a histo-

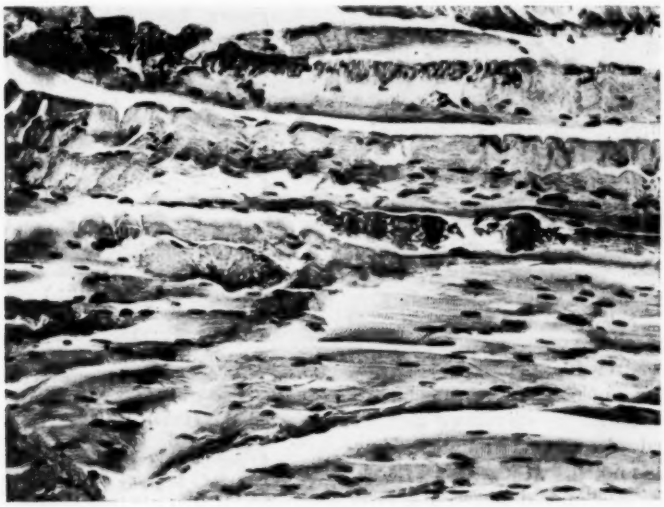

Fig. 7 — Immediately after denervation, stimulation was started and continued for 24 days. A variable picture of atrophy and degeneration of muscle fibers is evident. There is a general, but irregular, narrowing of the muscle fibers, although the cross striations are well preserved. In several areas there is a degeneration of the fiber, which becomes swollen, homogeneous, translucent, and vacuolated. Nuclei are irregularly distributed, some peripheral, others central (x200).

logic study of this kind. Only two will be mentioned: (1) technical difficulties in preparing sections, and (2) physiologic variations among animals and in the muscular tissue of the same animal. Degeneration did not occur uniformly nor at the same rate throughout the muscle even though denervation was performed at once, and therefore, one of the biggest problems is the localization of sample fields of equal and uniform degeneration for quantitative measurement of the number of nuclei and number and size of muscular fibers. This problem was reported earlier by Gutmann and Guttmann[10]. Their work on the rabbit showed a difference in the rate of atrophy between different parts of the same muscle, *particularly in the stimulated muscles.* Therefore, the histologic data reveal the basis for the results obtained following stimulation but do not provide absolute quantitative figures for reliable comparison.

Summary

Electric stimulation for fifteen minutes twice daily with sufficient intensity of current to produce vigorous contractions retarded loss of weight of muscle due to complete denervation in the rat. However, the atrophy due to denervation cannot be prevented entirely or delayed indefinitely.

Retardation of atrophy is enhanced and prolonged if the muscle is placed on tension and made to contract against a resistance during stimulation.

In this study, it was not possible to make *absolute* quantitative measurements for reliable comparison of the number of nuclei and the diameter of muscle fibers in the stimulated and unstimulated denervated muscle. However, it was noted that stimulated muscle had fewer nuclei and fewer fibers per unit area than did the unstimulated muscles. The fibers of the denervated stimulated muscles were larger than those of the denervated unstimulated muscles.

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Discussion

Dr. Clarence W. Dail (San Gabriel, Calif.): The research work reported in this paper on denervation atrophy is certainly a valuable addition to and confirmation of the previously recognized concepts.

I wish to ask a question relative to the fairly large discrepancy between decrease in diameter of the individual muscle fibers and decrease in muscle weight. What is the reason for this? Is this because diameter change is only in one dimension, whereas weight or volume change is proportional to at least two dimensions, that is, the fibers atrophy in width, thickness and possibly in length?

From a practical viewpoint, it should be emphasized that there was appreciably less atrophy when the muscles stimulated were made to contract from the stretched position and against force than when not required to do so. It should also be noted that these good results were attained by treatment periods of fifteen minutes to the muscle group twice daily. I should like to ask Dr. Wakim how this regime of what appears to be quite intense stimulation compares to the average clinical treatment?

In making clinical applications of these experimental findings we are presuming that muscle atrophy is something that retards recovery from denervation. This assumption seems reasonable but I believe that it has not yet been scientifically established that electrical stimulation shortens or improves clinical recovery. Certainly atrophy studies of a type that can be done on the clinical patient need to be done. Until this is accomplished under careful conditions and until carefully controlled clinical studies are performed, the effectiveness of electrical stimulation in denervation will remain controversial.

Dr. Wakim, what is your opinion of the rational of electrical stimulation in poliomyelitis where there is reversible and irreversible damage to the motor neuron cells?

Experimental Iontophoresis: Studies with Radio-isotopes

Edward P. O'Malley, Ph.D.
Y. T. Oest r, M.D., Ph.D.
and
Edward G. Warnick, M.D.
Chicago

Iontophoresis may be defined as the process wherein substances in solution are applied to the surface of the body and introduced into the tissues by the use of electrical current. This does not include electrophoresis, which, by definition, is a movement of a colloid (dispersed phase) in the presence of an electrical field, with the dispersion medium held constant. Similarly our use of the term iontophoresis does not include electroosmosis, which is defined as a movement of a liquid (dispersion medium), while the dispersed phase is held constant. In contradistinction to some of the literature, which has used these terms interchangeably, we wish to emphasize that in our opinion iontophoresis should be the only term applied to this general process. Some degree of either or both electrophoresis and electroosmosis may take place when chemical agents are applied to the body with the aid of an electrical circuit, but generally we apply ions in solution, not colloids.

There is an amazing lack of definitive, controlled, experimental studies concerning the process of iontophoresis. From the early experiments of Leduc[1] and including the recent work of Abramson[2], most experiments have dealt with clinical effects and were poorly controlled. Our previous study[3], has reported distribution and pharmacodynamic findings in the experimental animal with various compounds. Since there is no report on the use of radio-isotopes in iontophoresis, a logical extension of our earlier studies was to make use of radioactive substances as a means of studying the phenomenon of iontophoresis. Our purpose then was to study the distribution of radio-isotopes in various tissues following their introduction by iontophoresis.

Material and Methods

The radio-isotopes used were obtained from the Oak Ridge National Laboratory in Oak Ridge, Tenn., and from Abbott Laboratories in Chicago. The radioactive isotopes were obtained in a solution form. In all cases, two dilutions of this stock solution, as delivered, were made — 0.1 ml. of the stock solution diluted to 100 ml. with distilled water and 1.0 ml. of the stock solution diluted to 100 ml. with distilled water. Radioactivity counts were taken on both of these diluted samples and such counts were used as a basis for calculating the per cent uptake of the radioactive material by the animal. Table 1 lists the characteristics of the radioactive substances which were used.

Normal adult rats were used as the experimental animal. They were under pentobarbital anesthesia, thirty to fifty mg. per kg., administered intraperitoneally. Electrodes consisted of moistened cotton pads in contact with the surface of the rat, and held in place with wires from a current source. An electrode which we call the driving electrode was applied to the left front leg, and the second electrode, called the receiving electrode, was applied to the middle portion of the tail of the animal. A glass cylinder was slipped over the cotton

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Public Health Service Research Fellow of the National Institutes of Health;
Associate Professor and Acting Chairman, Department of Pharmacology and Experimental Therapeutics, Stritch School of Medicine, Loyola University; and Assistant Clinical Professor of Roentgenology, Graduate School, Loyola University, Chicago.
Graduate School, Loyola University, Chicago.

Table 1 — Radioactive materials used in iontophoresis

	P^{32}	I^{131}	I^{131} in Diiodofluorescein	Na^{24}	Ca^{45}
Chemical form	Na_2PO_4	I^{131} in $NaHSO_3$	Sodium diiodofluorescein	NaCl	$CaCl_2$
Radiation	β	β,γ	β,γ	γ	β
Solution in mls. for each rat	2	2	2	2	3
pH	5.0	6.0	7.9	4.0	4.0
Microcuries	30	100	100	10	300
Total counts per min. solution applied	2,018,000	5,111,400	3,076,800	1,402,305	768,000
No. of experiments	3	3	3	3	3
Selected driving electrode used	cathode	cathode	cathode	anode	anode

and the wire of the driving electrode and sealed with paraffin at the shoulder area. The radioactive material was introduced by dropper into the open end of the cylinder, to saturate the cotton. A Golseth-Fizzell Constant Current Generator was used, at a current strength of five ma. for one hour.

Results

The first experiments were completed, using the driving electrode of the same electrical sign as the ion which was applied. With each radioactive substance, experiments were also performed in which the driving electrode, instead of having the same electrical sign as the ion being used, was of opposite sign. In addition, control experiments were conducted in which all details of the procedure were carried out exactly, except that no electrical current was applied. In both of these last two instances, the radioactivity measurements in the tissues were essentially the same when either no current was used or when the driving electrode was of the opposite electrical sign to that of the active ion. In either case, only minute quantities of radioactive ions were found in the tissues. Such transportation, although minute, was clearly evident in certain tissues. In figures 1 and 2, the darkened area at the bottom of the bars indicate the per cent uptake under these conditions. A striking similarity in subsequent tissue counts is therefore noted between the control experiments (no current) and those in which the driving electrode was of opposite electrical sign to the ion which was applied.

Tables 2 and 3 are examples of the protocols from the individual experiments. Since all experiments were similar, for purposes of brevity, only these two are reproduced here. However, figures 1, 2, 3, 4 and 5 are bar graphs which represent the average results, obtained from three experiments, with each of the five radioactive substances.

Table 2 — Tissue uptake following iontophoresis with Ca^{45}

samples	driving electrode (anode) + (768,600 c/min.)		driving electrode (cathode) + (768,000 c/min.)		driving electrode (no current) + (768,000 c/min.)	
	c/min. per gram	% uptake per gram	c/min. per gram	% uptake per gram	c/min. per gram	% uptake per gram
driving electrode muscle	10,404	1.39	301	0.04	294	0.04
driving electrode bone	3,217	0.42	61	*	30	*
urine	3,869	0.50	31	*	30	*
blood	278	0.03	17	*	17	*
liver	211	0.03	13	*	8	*
kidney	128	0.02	6	*	6	*
between electrode muscle	37	*	8	*	7	*
indifferent tissue	16	*	5	*	5	*
receiving electrode tissue	12	*	3	*	4	*
receiving electrode cotton	11	*	2	*	1	*

* The counts here are regarded as statistically insignificant.
+ Total counts applied.

Table 3 — Tissue uptake following iontophoresis with I^{131}

samples	driving electrode (cathode) + (5,111,400 c/min.)		driving electrode (anode) + (5,111,400 c/min.)		driving electrode (no current) + (2,512,699 c/min.)	
	c/min. per gram	% uptake per gram	c/min. per gram	% uptake per gram	c/min. per gram	% uptake per gram
driving electrode muscle	56,184	1.33	1,070	0.02	519	0.01
driving electrode bone	5,229	0.12	170	•	126	•
urine	12,338	0.29	68	•	88	•
blood	2,293	0.05	23	•	45	•
liver	816	0.02	8	•	11	•
kidney	1,172	0.03	9	•	12	•
between electrode muscle	719	0.02	33	•	9	•
indifferent tissue	721	0.02	28	•	9	•
receiving electrode tissue	353	0.01	11	•	10	•
receiving electrode cotton	316	0.01	7	•	8	•

• The counts here are regarded as statistically insignificant.
+ Total counts applied.

P^{32}, I^{131}, Na^{24}, labeled diiodofluorescein and Ca^{45}, have definitely been demonstrated in various tissues of the body after iontophoresis. It has been shown that these isotopes, as illustrated by their presence in diverse amounts in various organs, enter into the body metabolism. For example I^{131} introduced by iontophoresis appears in the thyroid gland in amounts greater than any other tissue which was examined (fig. 1). This obviously indicates a remote and systemic distribution. The amount of I^{131} used in iontophoresis approximated 7.75×10^{-4} micrograms per ml. This helps explain the fact that non-radioactive inorganic iodine could not be detected in tissues after iontophoresis[3]. The total amount of the applied I^{131}, a fraction of a microgram, was too small even to be detected by ordinary sensitive chemical tests. Iontophoresis experiments with P^{32} (fig. 2) show the penetration of the material into the body systemically. Deposition occurred in a manner similar to that which would result had it been given by other routes of administration[4]. Similarly when Na^{24} was used (fig. 3), systemic distribution of the isotope throughout the rat, after iontophoresis, was obtained. Labeled diiodofluorescein, containing radioactive iodine, was demonstrated to be present in various organs after iontophoresis (fig. 4). The rather low uptake by the tissues of this radioactive substance, when compared to similar experiments using inorganic I^{131}, probably can be attributed to the fact that it is a large molecule, and much larger than the previous inorganic radioactive materials which were used. Ca^{45} was also found to be present in various body tissues following iontophoresis (fig. 5). Its presence in comparatively high concentration in bone after such experiments indicates its entrance into body metabolism.

Discussion and Conclusion

It is a physiological fact that an increase in temperature facilitates the rate of absorption of many substances. Such temperature rise often occurs when electrical current is passed through tissue. Therefore control experiments, where the pole opposite to the selected electrode was used, were of great importance. One might say, if no controlled experiments were run, that the rise in temperature produced by the flow of electric current at the region of the driving electrode was the factor which accounted for the penetration of the radio-isotopes into the tissues of the rat. However when the opposite pole was used as the driving electrode, under the same conditions, there was very little penetration of the radioactive materials into the tissues of the rat even though a similar current was applied. Such experiments demonstrate that the current itself and not the temperature phenomena accompanying it, was the primary

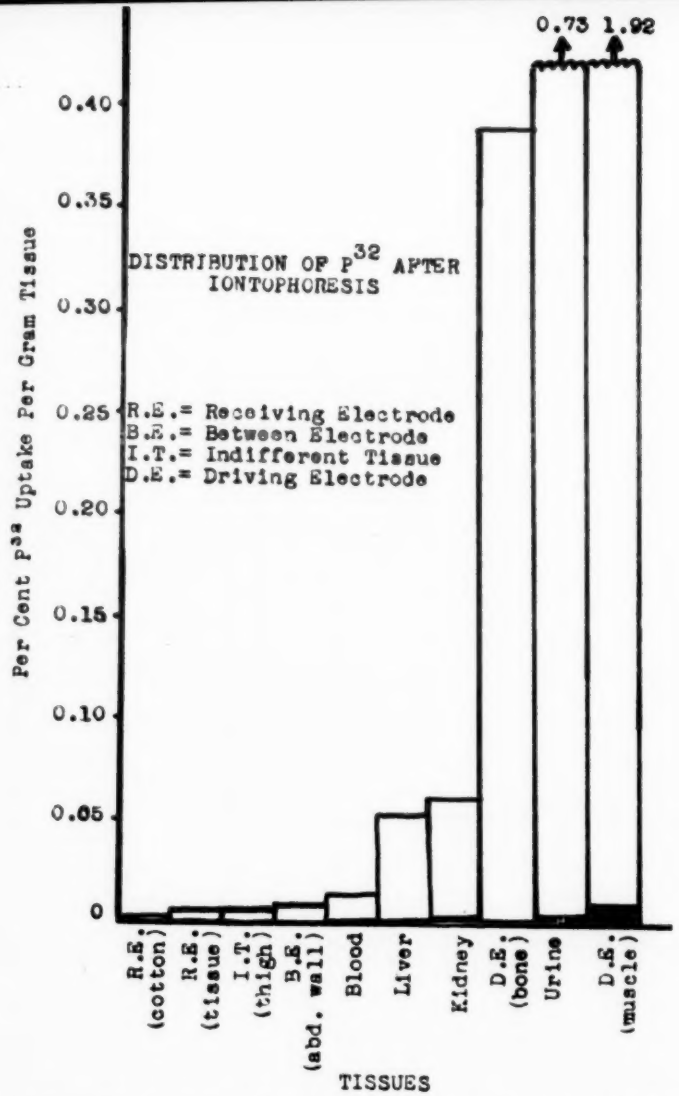

Fig. 2 — Distribution of P^{32} in selected tissues following iontophoresis using the cathode as the driving electrode. Solid black area represents radioisotope distribution when the anode was used as the driving electrode.

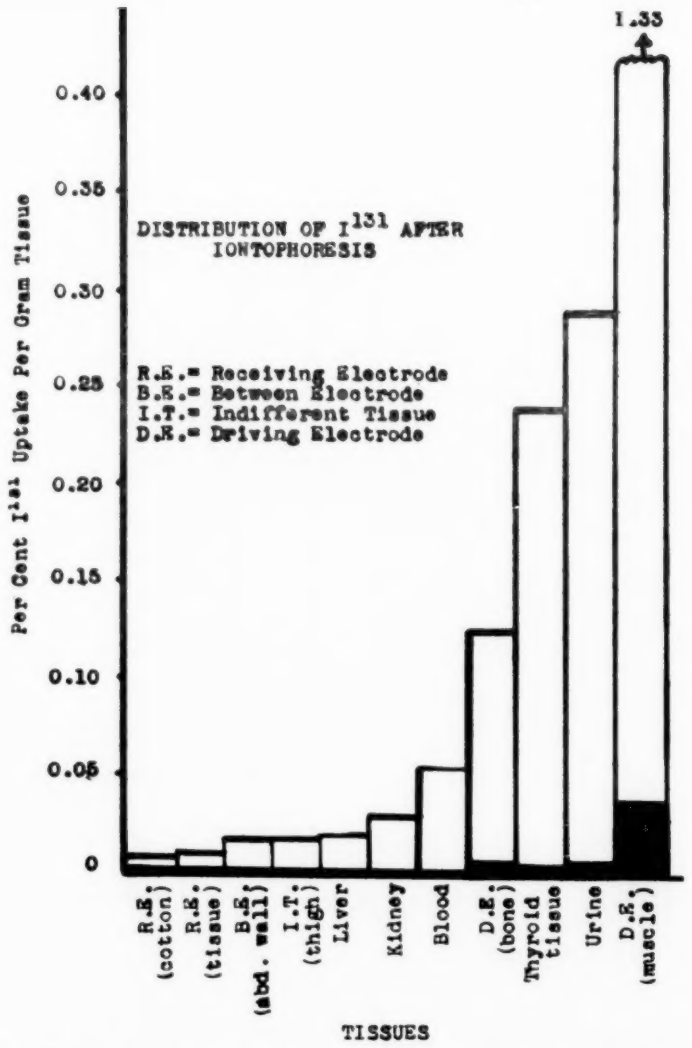

Fig. 1 — Distribution of I^{131} in selected tissues following iontophoresis using the cathode as the driving electrode. Solid black area represents radioisotope distribution following no electrical current.

factor necessary for significant penetration of the tracer substances into the rat.

It is apparent from our tissue uptake studies with the various isotopes that the tissue between the electrodes had no greater uptake than indifferent tissue such as the opposite thigh, etc. Such findings would tend to rule out the "tissue plane" hypothesis[5] as being the primary mechanism taking place during iontophoresis. It can also be said that local effects are not the only features involved in iontophoresis, as exhibited by our experiments. On the contrary, our findings point to a systemic or remote effect as a routine result in iontophoresis. These experiments support the conclusion drawn in our earlier publication[3].

Some of the substances used in our work, reported by others to have been introduced into tissues by iontophoresis, are calcium[6-9] and iodine[10,11]. None of

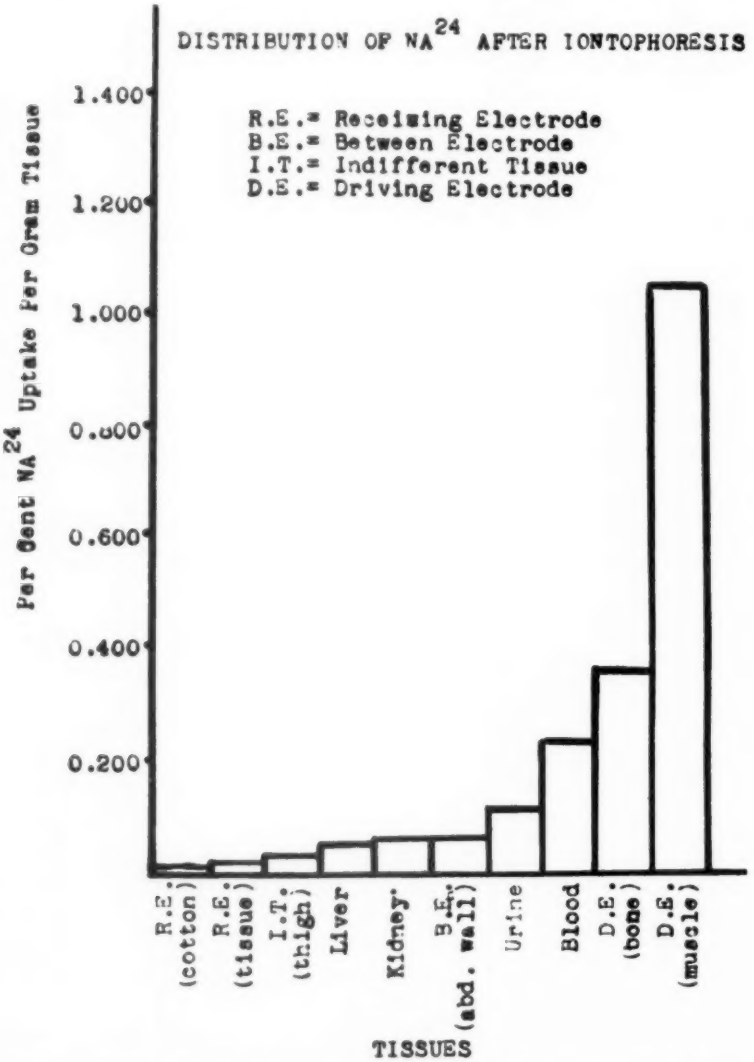

Fig. 3 — Distribution of Na^{24} in selected tissues following iontophoresis using the anode as the driving electrode.

these reports made any physical or chemical identification of the introduced substances. Clinical and pharmacodynamic responses were primarily used for evidence of distribution of the substances. The present report, therefore, using radioactive materials, and their identification in tissues, represents as far as we can determine, the first positive identification of the substances in tissues after their introduction by iontophoresis.

It was not possible in these experiments to determine which of the ions, positive or negative, penetrated into the tissues of the rat with greater facility. This is seen in tables 2 and 3 where both types of ions are seen to result in penetration.

We believe that all of the results, where there was a significant tissue distribution of the ion which was applied, are readily explained on a basis of in-

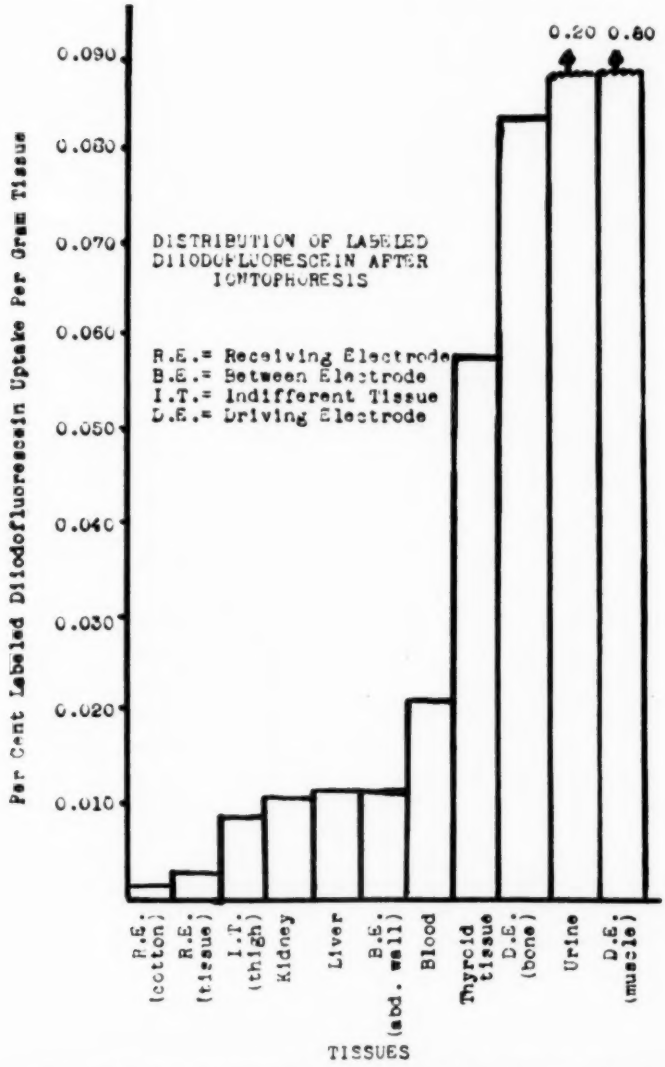

Fig. 4 — Distribution of labeled diiodofluorescein in selected tissues following iontophoresis using the cathode as the driving electrode.

troduction of isotopes into the tissues below the skin, by means of the electrical current, and subsequent circulatory systemic distribution.

Summary

The presence of P^{32}, I^{131}, Na^{24}, labeled diiodofluorescein and Ca^{45} has been demonstrated in various tissues of the rat following iontophoresis. This distribution of the radioactive substances in the tissues resembles that obtained when isotopes have been given by other routes.

Reversal of the electrical pole at the driving electrode, that is when the circuit pole was opposite in charge to that of the ions under investigation, using P^{32}, I^{131}, Na^{24}, labeled diiodofluorescein and Ca^{45}, resulted in little if any systemic penetration into the tissues of the rat.

By leaving the substance in contact with the rat at the driving electrode and using no iontophoresis, little if any, penetration into the tissues resulted.

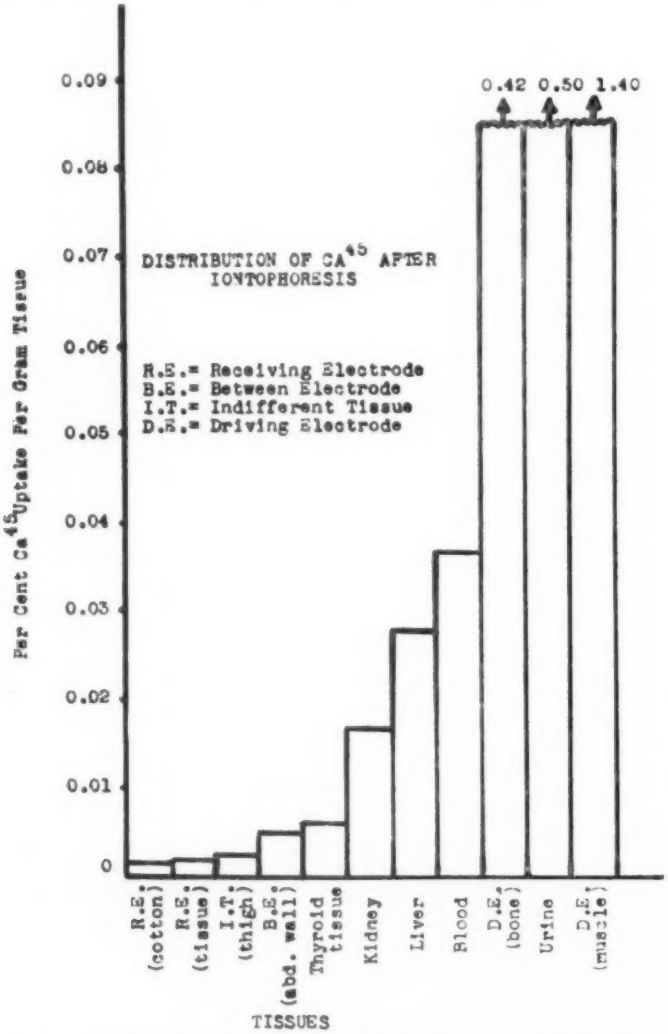

Fig. 5 — Distribution of Ca^{45} in selected tissues following iontophoresis using the anode as the driving electrode.

Similar negative results were obtained using the same substance and applying the electrical pole of the electrical circuit which had a charge opposite to that of the ion being used.

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Comparison of the Temperatures Produced by Carbon-Filament and by Tungsten-Filament Lamps

Khalil G. Wakim, M.D.
and
Frank H. Krusen, M.D.
Rochester, Minn.
(With the Technical Assistance of Clarence Hanson and Robert Arns)

Heat is one of the important therapeutic agents used in physical medicine. Several procedures for applying heat are in common use and their efficacy depends on the heating effect, with the attendant hyperemia and other bodily reactions consequent thereto. Hot packs, hot towels, heating pads and hot water bottles are fairly efficacious. Such agents heat the body by conduction. However, the body can be heated more easily and more conveniently by exposure to electric filament lamps. The heating effect of these lamps is practically all due to absorption of radiant energy. A very small fraction is due to conduction from the heated air. In departments of physical medicine and rehabilitation throughout the world, various types of lamps are used for heating the human body.

In the use of bakers for such purposes the carbon-filament bulb is not only very popular but is the one often recommended in spite of the fact that it is not easy to procure. There are two commonly used carbon-filament bulbs—one supposed to be equivalent to 60 watts, which is labeled 120 - 125 V; the other is labeled 120 W and 120 V. There is no convincing evidence, however, that the carbon-filament bulb is the best for these purposes. Accordingly, the question arose as to how the available carbon-filament lamps compare with the ordinary tungsten-filament lamp relative to their thermal intensities and their heating effects on the body. We wished to provide objective, experimental evidence in answer to this question.

Methods

In order to make careful comparison of the temperatures produced by tungsten-filament lamps and by carbon-filament lamps of specified wattage and voltage, the following procedures were applied. Under identical conditions the same U-shaped baker, equipped with four sockets for single bulbs, was used. Two series of studies were conducted.

In one series, dogs were anesthetized with pentobarbital sodium, 30 mg. per kilogram of body weight, given intravenously. After the hair of the abdominal wall and chest had been closely shaved, the animals were placed supine on the table. The U-shaped luminous baker was placed above the belly and was covered by a sheet, as in the usual clinical procedure. A thermometer, of which the mercury bulb was placed at a distance central from the light bulbs, was fixed to the dome in the top of the baker. Another thermometer was placed in such a manner that its bulb was in contact with the skin of the dog at a fixed distance from the light bulbs. Copper constantan thermocouples in hypodermic needles were inserted, each subcutaneously and intramuscularly, into the abdominal wall of the dog at a fixed central distance from the bulbs in the dome of the baker. The thermocouple temperatures were recorded galvano-

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Section of Physiology, Mayo Clinic;
Section of Physical Medicine and Rehabilitation, Mayo Clinic, Rochester, Minn.

metrically. After control temperatures had been established for the thermometer in the dome near the bulbs, for the one in contact with the skin of the belly of the dog, and for the subcutaneous and intramuscular needle thermocouples, the light bulbs in the baker were turned on and these same thermometers and the thermocouples were read and the temperatures were recorded 5, 10 and 15 minutes after the bulbs had been turned on. Then the bulbs in the baker were turned out. For each set of carbon-filament and tungsten-filament bulbs similar observations were obtained in different dogs; a minimum of ten experiments was performed with each set of lamps.

For another series of ten observations with each set of lamps, a thermometer with its mercury bulb in a central position, close to the light bulbs, was hung horizontally in the dome of the baker. Also, instead of using an animal, a pillow with a thermometer on its top (fig. 1) was placed under the baker so that the mercury bulb of the thermometer was located in a central position in relation to the light bulbs in the dome of the baker. After control values had been established the temperatures from these two thermometers were further recorded at 5, 10 and 15 minutes respectively after the lights in the baker had been turned on. The data were calculated and the averages were charted in the form of curves. The lamps were plugged into the usual 120 volt power supply line of the building.

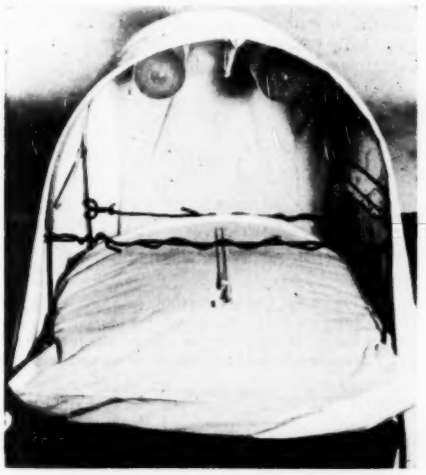

Fig. 1 — Position of baker over table, with thermometers in place; one between the bulbs at the dome of the baker and the other on the pillow top.

Results

Whether in heating the air in the dome of the baker or at the surface of the pillow, or in heating the cutaneous surface, the subcutaneous tissues and the muscles, the tungsten-filament bulbs proved to be at least as effective as the carbon-filament bulbs of similar magnitude in wattage and voltage. In figure 2 temperature curves are plotted for a period of fifteen minutes during which the four bulbs were turned on in the baker after the control temperatures within the baker had been established. It was clearly indicated in the individual experiments, as well as in the average of all the observations, that a

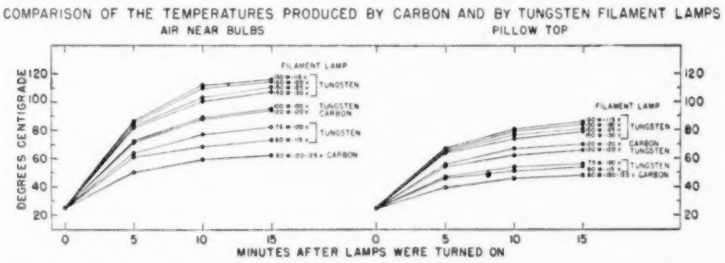

Fig. 2 — The rises in temperature of the air in the dome of the baker and at the pillow top when either carbon-filament or tungsten-filament bulbs are used for heating. Note the similarity of rises in temperatures produced by 100 W tungsten-filament bulbs and 120 W carbon-filament bulbs.

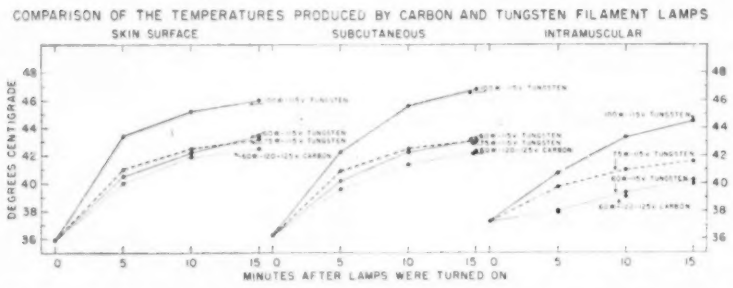

Fig. 3 — Demonstrating, in anesthetized animals, the rises in skin, subcutaneous and intramuscular temperatures during exposure to carbon-filament or tungsten-filament bulbs. Note that the 60 W carbon-filament bulbs did not produce greater rises in temperature than the 60 W tungsten-filament bulbs.

higher temperature of the air close to the bulbs in the dome of the baker was produced by the available tungsten-filament bulbs than by the available carbon-filament bulbs of equal wattage and voltage. In fact, the tungsten-filament bulb marked 100 W and 120 V gave a temperature curve practically identical to that produced by a carbon-filament bulb labeled 120 W and 120 V. Similarly, the tungsten-filament bulb marked 60 W and 115 V gave a higher temperature curve than the carbon-filament bulb marked 120 V and considered to deliver 60 W.

Temperature curves both for the air around the bulbs and for the air at the pillow top under the baker demonstrate clearly the well-known fact that the lower the voltage the higher the temperatures produced by tungsten-filament bulbs of the same wattage.

In order to compare the effectiveness of carbon-filament bulbs and of tungsten-filament bulbs in heating the tissues of the living body, anesthetized dogs were placed under the baker, which was draped in a manner similar to that of bakers applied clinically over the human body. After control temperatures of the air and of the skin, subcutaneous and intramuscular tissues had been established, the baker was plugged into the electric supply line in the laboratory and all four bulbs were turned on at the same time. The temperature curves in figure 3 were plotted. The individual records obtained as well as the average temperature curves shown in figure 3 clearly demonstrate that the temperatures produced by the tungsten-filament lamps were slightly higher than those of the carbon-filament lamps of the same wattage. The temperatures of the skin, subcutaneous and intramuscular tissues of the anesthetized animals were consistently higher under the influence of the tungsten-filament lamps than under that of the carbon-filament lamps. We did not use wattages any higher than 100 for the tungsten-filament bulbs and 60 watts for the carbon-filament bulbs in the series of observations on tissue temperatures because, for the same period of observation (fifteen minutes), higher wattage would have produced burns of the skin.

Review of Pertinent Literature and Comments

The work of Luckiesh[1,2,3] suggests that the tungsten filament is best for thermal effects on the body. He found that 88 per cent of incident energy was absorbed by the first inch of clear water in the case of the treated carbon-filament lamp but that less than 80 per cent was absorbed in the case of the tungsten-filament vacuum lamp. Such a percentage was even less for the gas-filled tungsten-filament lamp. He concluded that radiant energy from tungsten-filament lamps penetrates more deeply into water than that from carbon-filament lamps. By considering the spectral characteristics of blood and those illuminants he suggested that the same conclusions derived for water can be applied to blood.

Luckiesh[4] emphasized that the ideal source for heating bodily tissues to a depth is one which efficiently produces long-wave visible energy and short-wave infrared energy. He indicated that tungsten-filament lamps of high wattage are the best artificial source of such energy. Tungsten-filament lamps are efficient sources of radiant energy for heating human flesh to a depth, since they efficiently produce energy of wavelengths of 6,000 to 16,000 angstrom units. He advised the use of red glass for the bulbs of tungsten-filament lamps to reduce the light without reducing the flesh-penetrating energy. Fifty-three per cent of the total energy emitted by a 500 watt tungsten-filament lamp, but only twenty-six per cent of that of the carbon-filament lamp, was found in the spectral region in which human flesh is fairly transparent. It must be remembered that the energy to which human flesh is transparent can proceed to greater depths in the body where it is absorbed and heats the tissues.

One of us[5], in a summary of this subject, wrote that rays from infrared generators are merely heat rays. There is nothing mysterious or unusual about their properties. The rays from infrared generators are less penetrating than those derived from luminous sources such as the tungsten-filament bulb. Carbon-filament bulbs are used for generation of infrared rays as well as visible rays. They are more effective sources than nonluminous generators for production of infrared radiation. From the findings of Luckiesh and from our data herein presented, it can be definitely stated that tungsten-filament lamps are more effective in producing heat penetration than are carbon-filament lamps. Luckiesh[6] emphasized that they are superior to sunlight and are much better than carbon-filament lamps for supplying radiation for heating bodily tissues at a depth.

Paul and others[7,8] reported that luminous sources heated the skin and subcutaneous tissues slightly more than nonluminous sources. In earlier studies[9,10] we obtained slightly higher rises in the temperature of the skin and subcutaneous tissues with far infrared than with near infrared. We concluded that far infrared radiation is more efficient than near infrared.

Anderson[11] and also Kovács[12], expressed their ideas regarding penetration and absorption into tissues as follows: A radiator operating at relatively low temperature emits radiation of long wavelengths which is absorbed primarily in the stratum corneum of the skin; a generator at high temperature such as a tungsten-filament lamp emits a preponderance of near infrared and visible radiation which penetrates deeply through cutaneous layers, and even through subcutaneous layers of fat and muscle. Between these two are generators, such as the carbon-filament lamp, which give less heating effect in the stratum corneum than does an iron resistor but more than a tungsten-filament lamp. Radiation from the carbon-filament lamp would penetrate less than that from the tungsten-filament lamp. In 1950, Kovács[12] stated that there were as yet no reliable clinical data to indicate any preference in routine application of radiant heat therapy; and that individual preferences of patients sometimes favor one source over the other. The bright light is bothersome, but the dull glow of infrared feels more comfortable. However, excluding the face from the area eliminates the bothersome bright light.

Summary and Conclusions

Under identical conditions the effects of carbon-filament lamps and of tungsten-filament lamps of specified wattage and voltage on the temperature of the immediate environment within the U-shaped baker as applied clinically, and on the skin, subcutaneous and intramuscular temperatures of the anesthetized animal, were repeatedly determined and compared. The rises in temperature produced by the tungsten-filament lamp delivering 60 watts at 115 volts were higher than those produced by a carbon-filament lamp of similar wattage

and voltage when plugged into the same supply line. Similarly, the rises in temperature produced by a tungsten-filament lamp delivering 100 watts at 120 volts gave a curve practically identical to that produced by a carbon-filament lamp delivering 120 watts at 120 volts. These observations provide evidence to justify the conclusion that under identical conditions the ordinary tungsten-filament lamps can produce as much or slightly greater rises in the environmental and tissue temperatures than carbon-filament lamps of the same wattage and voltage. The lower the voltage the higher the rise in temperature produced by tungsten-filament lamps of the same wattage when connected to the same supply line. The findings in this study give no support for the preference of carbon-filament lamps over tungsten-filament lamps for purposes of heating bodily tissues.

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Gait-Training Bars

Duane A. Schram, M.D.
Seattle, Wash.

Parallel bars are frequently used in early walking re-education because they offer more stability than crutches. As the patient progresses he will graduate to crutches when the balance pattern is learned and confidence established. In many cases the transition from bars to crutches is a considerable problem because the patient has been taught an entirely different pattern on the bars compared to that which he will use on crutches. In designing a set of parallel bars, it would therefore seem preferable to construct them so they would simulate crutch walking as closely as possible and still retain the fundamental qualities of stability that are inherent in a parallel bar unit. Also, it would be equally desirable that the bars be adjusted each time to fit the individual patient and the operator should have no difficulty in making this adjustment simply and quickly.

The Gait-Training Bars illustrated in figure 1 are designed to simulate crutches as closely as possible. The uprights are angled outward, and this angle which is about ten degrees, is the average width between crutch handgrips as the distance from floor to handgrips increases. For all practical purposes this average variability is adequate. The individual bars are twelve feet in

Chief, Physical Medicine and Rehabilitation Service, VA Hospital, Seattle; formerly Medical Director, Gonzales Warm Springs Foundation, Gonzales, Texas.

Fig. 1

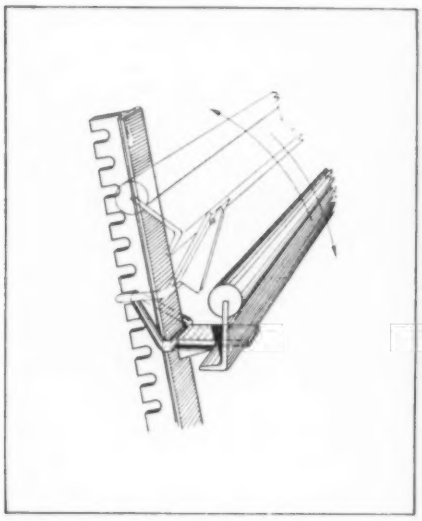

Fig. 2

Fig. 3

length and consist of unequal angle aluminum with one and one-half inch doweling mounted on the long side. The diameter of this doweling is a little larger than a crutch hand-grip for it is found that a larger bearing area is desirable to condition, as early as possible, patients' hands for the smaller crutch grip.

Figure 2 illustrates the hinge arrangement in which the bars are slung on the uprights. It will be noticed that the hinges are wedged on the upright "T" iron so there is stability when any pressure is exerted either downward or longitudinally. If any pressure is exerted upward, the bars will be unstable and enough movement will result to elicit a tell-tale sign of improper balance, but not enough movement for the patient to lose his balance. The patient is taught to push downward, since this will be the condition existing when walking with crutches. Most parallel bars in use today are rigid and permit a patient to learn the faulty habit pattern of pulling upward in retaining balance.

One of the greatest advantages in the use of this unit is the ease with which the bars can be adjusted. One person in a few moments can make the adjustment simply by lifting the bar in the middle on the inside and rotating it upward and outward toward the uprights (fig. 3). When the proper level is found, the colored notches on the respective sides are matched and the bar is then allowed to rotate backward into position. The distances between the notches on the uprights are one and one-quarter inches.

The basic unit, consisting of bars, hinges and uprights, can be assembled for stationary or portable use. The stationary unit is mounted directly on the floor, while the mobile unit is mounted on three-quarter inch plyboard that has retractible wheels (fig. 3). These Gait-Training Bars have been in use for the past three years and found to be popular with the therapists and effective in preparing the patient for crutch walking.

EDITORIAL

ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION
OFFICIAL JOURNAL

American Congress of Physical Medicine and Rehabilitation
American Society of Physical Medicine and Rehabilitation

The Accuracy of the Manual Muscle Test

In a recent article[1], an attempt was made to assess statistically the reproducibility of the manual method of muscle testing which is in general use throughout the country. In the national program for evaluation of gamma globulin in the prophylaxis of paralytic poliomyelitis, it was necessary to have many physical therapists testing patients throughout the country. To standardize testing technics four orientation sessions were held for four different groups of examiners. At the end of each session, patients were examined independently by a number of examiners to determine the variability of grading existing between examiners. One of the conclusions from this test was "that a comparison of the absolute difference in muscle scores indicated that the average difference in scores between different examiners was approximately three per cent."

In any method developed for diagnosis or evaluation, it is desirable to have the greatest possible accuracy. It is even more important that the accuracy or reproducibility of the method be known so that its limits of usefulness be understood.

The manual method of muscle testing is the most useful and practical method yet devised. Since first introduced by Lovett, numerous attempts have been made to refine and improve it. The simple test of the six grades normal, good, fair, poor, trace, and no function, is still the most practical for evaluating a patient with weakness. However, it must be recognized that at only one level of strength (fair), and only for the larger joints, is there an objective measurement of strength. The ability to move the part through the range of motion against gravity or to hold the part against gravity are objective measures requiring a minimum of judgment. Nevertheless, even at this grade, in comparing observations on one patient with those on another patient, the length of the lever arm of the extremity, the bulk of the extremity, and the distribution of that bulk need to be taken into consideration. In the absence of such information, it is not valid to assume that two muscles graded fair have equal strength or that they have sustained equal loss of strength. At all other levels of strength, performance is evaluated by the examiner on the basis of multiple impressions. The examiner's judgment must take into consideration what the patient would be able to do if he were normal for his age and size. For example, the amount of resistance applied in addition to gravity to differentiate

a muscle of good strength from one of normal strength depends on the patient's previous activity. This is strikingly illustrated in the case of the man working as a stevedore who, after poliomyelitis, shows atrophy of one arm. That arm will withstand all of the resistance the examiner can apply and would be considered an arm normal in strength for the average individual, yet, obviously, the arm is not normal when compared to the opposite side.

There are many factors which influence the accuracy of the manual muscle test. In testing small children, an estimate must be made of the normal strength. The relative strengths of examiner and patient may influence the grade. Full cooperation by the patient is necessary. Indifferent participation will alter the score. Fatigue and distracting influences also must be considered when evaluating reliability of tests carried out on a busy ward, during the acute poliomyelitis season. The interpretation of strength of a test will agree most closely for two examiners who have worked together for a period of time and compared results. After a few weeks of independent work, there will be some divergence of grading.

The grade points in the manual muscle test are not equally distributed. Indeed, each grade point does not represent the same degree of muscular effort for all muscles. It is unfortunate that the attempt was made to refine the test by applying percentage figures to the various grades and even splitting grades on the basis of ability to perform various maneuvers[1]. The percentage grading scale implies an accuracy of grading of five to ten per cent of maximal muscular strength. Actually, no measurements have been reported of the relationship between the maximal strength of a muscle and the strength required to perform each of these grade tasks. The use of "per cent" in the grading terminology is, therefore, deceptive. It refers to an arbitrary non-lineal scale of activity rather than to the relationship of the condition of the patient after poliomyelitis to that when he was in good health. It has been pointed out that "certain muscles at various ages possess a normal strength which is less than 100 per cent. . . Fifty per cent anterior neck muscle strength which indicates the ability to support the weight of the head in an antigravity position may be considered the normal accomplishment at the age of 5. Thirty per cent strength is normal for a three-year old child."[2]

It is necessary to be thoroughly familiar with the terminology as well as the method so that one may not be deluded by this apparently straight-forward numerical evaluation of strength.

Lilienthal, in his statistical analysis of reproducibility of scores, evolved a method of scoring each muscle or muscle group on the basis of manual muscle test performance times a factor for size. He compared total scores of patients obtained by grading approximately eighty muscle groups. Some groups, such as finger flexors, involve many muscles and when spotty involvement occurs, there is no satisfactory means of giving one grade to represent the varied involvement. Other complex functions for which evaluation could only be guessed, were deglutination, mastication, palatal function, respiration, and function of facial muscles. When the grades of all muscles of each patient were summed and the scores arrived at by different examiners were compared, it was found that in some cases there was a five-fold difference in the patient's score. When the scores of all patients tested by each examiner were averaged, the correspondence was better; i.e., the average difference of the group score was three per cent of the possible score.

It is likely that the percentage system used by Lilienthal for comparing patients' scores will be confused with the previously mentioned system of scoring the manual muscle test on a per cent basis[2]. It, therefore, is important to clarify that this analysis does not indicate ability to grade muscles within three per cent of their actual strength. The three per cent figure is not a comparison of reproducibility of testing individual muscles. This figure refers only to the

difference in average scores obtained when two examiners test a relatively large group of patients under optimal conditions.

In the Lilienthal study, evaluation of the difference in grades given to individual muscles by different examiners showed that in 25 to 34 percent of the individual muscle tests, trained physical therapists differed by one grade or more in grading individual muscles. If this is interpreted in terms of the percentage system of grading, in ¼ to ⅓ of the tests, the difference in grading individual muscles was greater than 25 per cent. When the comparison was between persons with less training in manual muscle testing, differences of grading of 25 per cent or more occurred in 55 per cent of muscles tested. These figures support a prevailing impression that in a careful muscle test, the accuracy is usually within one grade. Attempts to subdivide the grades are not reliable. Attempts to grade an individual muscle in per cent of normal strength imply an accuracy which does not exist since errors of the order of 25 per cent will occur frequently.

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. . . ANNUAL REPORTS . . .

American Congress of Physical Medicine and Rehabilitation

American Society of Physical Medicine and Rehabilitation

American Registry of Physical Therapists

Report of the Finance Committee

The report of our auditor which follows indicates that for the year ending December 31, 1953, the American Congress of Physical Medicine and Rehabilitation continued to operate on a sound financial basis.

Louis B. Newman
Walter M. Solomon
Charles S. Wise

AMERICAN CONGRESS OF PHYSICAL MEDICINE AND REHABILITATION

Report on Examination For the Year Ended December 31, 1953

May 19, 1954

Board of Governors,
American Congress of Physical Medicine
and Rehabilitation,
30 North Michigan Avenue,
Chicago, Illinois.

Dear Sirs:

We have examined the balance sheet of the American Congress of Physical Medicine and Rehabilitation as of December 31, 1953, and the related summary of net income and surplus for the year then ended. Our examination was made in accordance with generally accepted auditing standards and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances, except as stated in the following paragraph.

We did not verify the income from subscriptions to ARCHIVES, a magazine published monthly by the Congress, because it was not considered practicable. However, we tested the correctness of the subscription income recorded on the books by reference to available supporting data.

Based on our examination, limited to exclude verification of ARCHIVES subscription income, in our opinion, the accompanying balance sheet and summary of net income and surplus present fairly the financial position of the American Congress of Physical Medicine and Rehabilitation at December 31, 1953, and the results of its operations for the year then ended in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

We submit the following exhibits and schedules:

Exhibit
A—Balance Sheet, December 31, 1953.
B—Summary of Net Income and Surplus for the Year Ended December 31, 1953.

Yours Truly,
George Rossetter & Co.

Exhibit A

American Congress of Physical Medicine and Rehabilitation
(Incorporated in Illinois — Not for Profit)

Balance Sheet, December 31, 1953

Assets

Current Assets:		
Cash in Bank and on hand		$21,401.40
Accounts receivable:		
Advertisers and exhibitors	$ 1,093.18	
Membership dues—Schedule 1	280.00	
American Registry of Physical Therapists	2,547.13	
American Board of Physical Medicine and Rehabilitation	76.06	
American Society of Physical Medicine and Rehabilitation	109.06	4,105.43

Investment in United States Savings bonds—at cost	33,000.00
Accrued interest	257.47
Deposit at United States Post Office	50.00
Inventory of envelopes—"Archives"	297.66
Total	$59,111.96

Liabilities

Current Liabilities:	
Accounts payable	$ 843.17
Accrued salaries	319.21
John S. Coulter Memorial Fund	455.00
Richard Kovács Memorial Fund	50.00
Subscriptions to ARCHIVES—unexpired portion	7,068.80
Dues collected in advance—year 1954	380.00
Total current liabilities	$ 9,116.18
Surplus, per Exhibit B	49,995.78
Total	$59,111.96

Exhibit B

American Congress of Physical Medicine and Rehabilitation

Summary of Net Income and Surplus for the Year Ended December 31, 1953

Income:		
Membership dues		$11,060.00
"Archives":		
Advertising — less discounts — net	$11,749.08	
Subscriptions	14,289.67	
Sale of cuts, etc.	714.62	26,753.37
Interest on United States Government securities		799.20
Convention income:		
Exhibits	$10,500.00	
Special instruction course	1,822.00	
Total	$12,322.00	
Direct convention expenses—Schedule 1	5,488.96	
Convention income—net		6,833.04
Miscellaneous		134.27
Total income		$45,579.88
Expenses:		
Office salaries and expenses:	$23,938.71	
Printing—"Archives"	15,997.83	
Cuts, half-tones, electros, etc.	661.80	
Pay roll taxes	173.22	
Professional fees	942.40	
Loss on uncollectible accounts	13.50	
International Federation of Physical Medicine	154.28	
Special meeting	512.71	
Sundry	578.51	
Total expenses	$42,972.96	
Less share of expenses billed to:		
American Board of Physical Medicine and Rehabilitation	$ 250.00	
American Society of Physical Medicine and Rehabilitation	120.00	
American Registry of Physical Therapists	12,000.00	12,370.00
Expenses—net		30,602.96
Net income for the year		$14,976.92
Surplus, December 31, 1952		35,018.86
Surplus, December 31, 1953		$49,995.78

AMERICAN SOCIETY OF PHYSICAL MEDICINE AND REHABILITATION

Report on Examination For the Year Ended December 31, 1953

May 19, 1954

Board of Governors,
American Society of Physical Medicine and Rehabilitation,
30 North Michigan Avenue,
Chicago, Illinois.

Dear Sirs:

We have examined the balance sheet of the American Society of Physical Medicine and Rehabilitation as of December 31, 1953, and the related statement of net income and surplus for the year then ended. Our examination was made in accordance with generally accepted auditing standards and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the accompanying balance sheet and statement of net income and surplus present fairly the financial position of the American Society of Physical Medicine and Rehabilitation at December 31, 1953, and the results of its operations for the year then ended in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

We submit the following exhibits:

Exhibit
A—Balance Sheet, December 31, 1953.
B—Statement of Net Income and Surplus for the Year Ended December 31, 1953.

Yours Truly,
George Rossetter & Co.

Exhibit A

American Society of Physical Medicine and Rehabilitation
(Incorporated in Illinois — Not for Profit)

Balance Sheet, December 31, 1953

Assets

Current Assets:		
Cash — Michigan Avenue National Bank of Chicago		$3,290.29
Accounts receivable —members		40.00
Total		$3,330.29

Liabilities

Current Liabilities:		
Accounts payable—trade		$ 34.54
Accounts payable—American Congress of Physical Medicine and Rehabilitation		109.06
Dues collected in advance		55.00
Total current liabilities		$ 198.60
Surplus, per Exhibit B		3,131.69
Total		$3,330.29

Exhibit B

American Society of Physical Medicine and Rehabilitation

Statement of Net Income and Surplus for the Year Ended December 31, 1953

Income:		
Members' dues		$ 755.00
Initiation fees		220.00
Banquet — annual meeting — net		27.67
Miscellaneous		.15
Total income		$1,002.82
Expenses:		
Share of office expense billed by American Congress of Physical Medicine and Rehabilitation	$120.00	
Professional fees	315.16	
Fidelity bond premium	10.00	
Office supplies	192.42	
Miscellaneous	94.36	
Total expenses		731.94
Net income for the year		$ 270.88
Surplus at beginning of the year		2,860.81
Surplus at end of the year		$3,131.69

AMERICAN REGISTRY OF PHYSICAL THERAPISTS

Annual Report

January 1 -- December 31, 1953

The major activities of the Registry follow the purposes for which it was organized; namely, to promote the art and science of medicine through an understanding and utilization of the functions and procedures of physical medicine in the prevention, treatment or alleviation of human ailments and the maintenance of or restoration to health; to maintain a list of physical therapists competent and qualified to administer adequately physical therapy under the prescription, direction and supervision of licensed physicians, and to promote a widespread utilization of such list to the end that the facilities and methods employed in physical therapy may effectively augment the services of American medicine. All of its activities represent an effort on the part of the Registry to carry out its original purposes. No phase of service is overlooked in this effort.

Miss Margaret Moore and Miss Elizabeth C. Wood, representing the American Physical Therapy Association on the Board, were re-elected to serve a term of two years beginning January 1, 1954. Dr. Donald L. Rose was appointed to serve a term of three years beginning September 1, 1953. He was selected to fill the vacancy created by the resignation of Dr. William Bierman. Dr. Arthur L. Watkins was appointed to serve on the Board for a period of seven years beginning January 1, 1954.

At the Interim Meeting, April 11, 1953, Hotel Statler, New York City, the following motions were passed:

New Registry examination to be developed in 1954 with a new pool of items to be developed in 1955.

Therapists are to be reinstated as members in good standing on payment of five years back dues no matter how long the individual has been delinquent; such reinstatement is subject to approval of Registry Board.

Appreciation of motion passed in AMA House of Delegates relative to establishment of a bureau to deal with problems of lay technical personnel.

Registry Board vote shall not be considered valid unless it be passed on by a quorum of the membership, and that of those voting on the initial presentation of a matter, the vote shall be unanimous before it is to be approved; on resubmission, the vote shall be two-thirds of those voting.

At the Annual Meeting, September 1, 1953, Palmer House, Chicago, the following motions were passed:

Appointment of committee to attempt to advise on reasonable state laws in cooperation with the American Physical Therapy Association; the sum of $500 has been allocated to this committee for necessary expenses and this amount may be increased at the discretion of the Board.

"Principles of Ethics for Registrant Members of the American Registry of Physical Therapists" be accepted and incorporated in the Registry booklet of information.

Registry By-Laws be revised in accordance with the official notice sent to members of the Board.

Resignation of Dr. Bronson Crothers as member of the Advisory Board be accepted and that the American Neurological Association be contacted relative to appointing his successor.

Acceptance of Dr. William Bierman's resignation as Chairman and member of Registry Board; Dr. Earl C. Elkins was elected Chairman, Dr. Robert L. Bennett was elected Vice-Chairman, and Dorothea C. Augustin was elected Registrar, Secretary and Treasurer.

By rising vote, a motion of appreciation was put into the records for the years of service Dr. Bierman has given to and his great interest in the Registry.

The following therapists now in the junior classification be granted senior registration without examination: Mildred E. Albert, Sr. Rosemond Belongeay, Sr. Mary Benedict, Sr. Mary Carmella Bentzler, Sr. Tatiana Bolz, Marcella Byrum, Mary A. Caskey, Mae A. Cefarelli, Sr. M. Chrysantha, Alida G. Currey, William Dagg, Sr. Willibalda Dasenbrock, Marguerite Daughters, Mary A. Doyle, Sr. Mary Edwin, Virginia M. Ellett, Henry Engler, Bessie V. Fidler, Laura J. Flournoy, Paul Furman, Katherine M. Giblin, Mildred R. Grillo, Mary A. Hanley, Elsie C. Hemlock, Russell Hill, Winifred Hoskins, Opal A. Ingraham, Sr. Arnolpha Jendrossek, Sr. Estelle Katzoreck, Florence Knoblock, Sr. Adelaide Krivich, Sr. Evarista Kumpernas, Sr. M. Liberia, Ruth Mann, Bernice L. Miller, Alma B. Monticino, Dorothy J. Moore, Sr. Mary Philip Neri, Sr. M. Georgia Ninnig, Sr. Pia Nitschpan, Helen E. Nordell, Edith L. Nyman, Isabelle G. O'Hern, Phyllis N. Parker, Sr. Marie Pascal, Lorenz E. Peterson, Virginia Phillips, Sr. Adrian Pogrzeba, Sr. Ellen Rennscheidt, Sr. Vincent Ryan, Beatrix M. Sakowitz, Viola F. Saunders, Sr. Apollonia Schmidt, Louise Schrupp, George O. Shecter, Marie F. Short, Sr. Marka Slootweg, Helen F. Sparling, Lelia M. Stokes, Joseph S. Strelak, Sr. M. Mildred Teson, Albin G. Thompson, Mary C. Thompson, Gladys L. Unsell, Martin R. Vassallo, Mabel F. Velardi, Louise D. Vermilye, Maizie M. Williams, and Lucy A. York.

The following therapists are to retain their junior classification: Margaret J. Bell, Sr. Gabriel Marie Briend, Sr. Mary Mark Cannon, Ruth M. Deininger, Florence D. Foegele, Elizabeth A. Garrett, Ilse R. Geldern, Anna M. Harlfinger, Sr. Alma Joseph Herber, Leon A. Jaris, Theodore D. Patlian, Marguerite B. Speck, and Sr. M. Philonilla Weintraut.

The following therapists in the junior classification are to be investigated further before any final decision is made relative to their status: Sr. Mary Kostka Glueckstein, Emma Hupprich, John Logan, Myra Miller, and Ermenia Pignatelli.

A number of special problems were considered and several interim actions were completed by the Registry Board in 1953.

The following registrations were cancelled: Mr. James M. Cox, 20 Gloucester St., Boston 15, Mass.; Mrs. Isobel A. Nobles, 2179 Berkeley Ave., St. Paul 5, Minn., and Mr. George S. O'Brien, 905 Medico Dental Bldg., San Jose 13, Calif.

The following member was reinstated: Mrs. Helen Oakley Hardy, 1261 N. College Ave., Claremont, Calif.

The following members have been dropped from the roster of therapists in good standing for non-payment of dues: Barbara E. Agnew, Joseph J. Arav, Bernidine Atwood, Nancy A. Batemen, Virginia D. Bauer, Bess D. Bernhard, Paula Blackman, Audrey P. Bohlken, Ruth F. Bryan, Robert E. Butcher, Evelyn M. Chamberlin, Margot G. Cruse, Mary C. Davis, Carol R. DeBoos, Anthony J. DeRosa, Bernice B. Eller, Elizabeth K. Evans, Roberta E. Favors, Barbara E. Ferguson, Marie Filler, Ruth R. Frey, Ruth M. Garrity, Ann K. Gaulke, Geraldine H. Ghent, Frances J. Gillespie, Isabel B. Grover, Betty L. Hale, Joan K. Hampson, Mary M. Hannon, Clarence W. Hardiman, Stella Hauetter, Virginia W. Helme, Marjorie P. Heres, Erna A. Hermann, Rita E. Hess, Phyllis M. Johnson, Florence W. Kalmbacher, M. Denne Kuntz, Ann H. LeBar, Hilda H. McCarthy, William J. McCracken, Jessie E. McElrath, Josephine U. McGraw, Elizabeth K. Medlin, Margaret H. Miller, Mary S. Mobbs, Carmen S. Montgomery, Kathleen B. Moran, Olive M. Morris, Constance D. Newell, Ethel M. Norton, Angeles A. Nunez, Sr. M. Imelda Ogintas, Barbara A. Olmsted, Bette P. O'Reilly, Marjorie T. Patterson, Dorothy J.

Peterson, Edna M. Poplin, Nadine S. Pugmike, Barbara Ransom, Alta H. Rawsthorne, Rosemary G. Reid, M. Louise Reinecke, Ann H. Revyn, Elaine B. Rowe, Alma J. Salyer, Elizabeth B. Schnebly, Jane V. Schuler, Dorothy H. Skrabut, Joseph Smiga, Jessie C. Smith, Mada Steele, Barbro T. Stensrud, Elizabeth B. Stevenson, Ethel F. Thom, Lillian V. Thomas, Marion H. Threadgill, Jean B. Tice, Louis Treisman, Jane Turner, Agnes Uvick, Herbert Vanderwalde, Helen S. Vogel, Valdo H. Von Kaenel, Mary M. Watt, Clara M. Weigele, Alla G. Williams, Jeane R. Wingfield, and Margaret C. Winters.

The following members have dropped their membership: Maxine Anderson, Minnye Anderson, Pauline Andres, Eva Applegate, Jesse L. Babcock, Marion W. Beytes, Rosemary J. Bickett, Mathea A. Boxeth, Joseph M. Breuer, Jefferson I. Brown, Josephine J. Buchanan, Marian A. Denny, Mary E. Disbrow, Betty L. Fleming, Don M. Gill, E. May Gorsline, Margaret Greenawalt, Mary E. Haskell, Celeste A. Hayden, Robert C. Holmes, Nora Jackson, Anna C. Knott, Sara E. Kollman, Catherine G. Later, Ruth K. Laznik, Hazel I. Lewter, Marjorie P. Lilga, Dorothy E. Lovdahl, Nina T. Marth, Eyrlis R. McClish, Nancy N. Mohler, Ileana W. Norris, Rebecca M. Osborn, May E. Prugger, Eleanor Reaney, Frances H. Ryder, May W. Sara, Kathleen D. Schovanec, Maude S. Stewart, Sue B. Swartzlander, Ann M. Van Eyck, and Josephine M. Whalen.

The following members are deceased: Florence E. Case, Mildred L. Edwards, Edith I. Goldsmith, Elaine M. Groat, Cynthia M. Mabbette, Viola M. Visel, and Leland E. Wood.

Certificates Issued According to School of Graduation

Name of School	Number of Graduates Registered
Albany Hospital, Albany, N. Y.	1
Baylor University Hospital, Dallas, Tex.	11
Boston University College of Physical Education for Women, Sargent College, Cambridge, Mass.	30
Bouve-Boston School of Physical Education, Medford, Mass.	12
University of California School of Medicine, San Francisco	16
Charity Hospital of Louisiana, New Orleans, La.	7
Childrens Hospital, Los Angeles	14
Cleveland Clinic, Bunts Educational Institute, Cleveland	10
College of Medical Evangelists, Los Angeles	8
University of Colorado, Denver	14
Columbia University, College of Physicians and Surgeons, New York City	34
Duke University, Durham, N. C.	10
Hermann Hospital, Houston, Tex.	14
Hospital for Special Surgery, New York City	1
State University of Iowa College of Medicine, Iowa City	22
University of Kansas Medical Center, Kansas City, Kan.	13
Mayo Clinic, Rochester, Minn.	37
Medical College of Virginia, Baruch Center of Physical Medicine and Rehabilitation, Richmond, Va.	43
University of Michigan, Ann Arbor	7
University of Minnesota Medical School, Minneapolis	17
New York University, School of Education, New York City	29
Northwestern University Medical School, Chicago	13
Division of Physical Therapy, School of Auxiliary Medical Services, University of Pennsylvania, Philadelphia	35
Simmons College, Boston	11
St. Louis University, Division of Health and Hospital Services, St. Louis, Mo.	14
University of Southern California, Los Angeles	31
Stanford University, Stanford University, Calif.	28
University of Texas School of Medicine, Galveston	4
Washington University School of Medicine, St. Louis, Mo.	11
D. T. Watson School of Physiatrics, Leetsdale, Pa.	20
University of Wisconsin Medical School, Madison	18
Medical Department—U. S. Army	
Brooke Army Medical Center, Ft. Sam Houston, Tex.	14
Percy Jones, Battle Creek, Mich.	1
Letterman Army Hospital, San Francisco, Calif.	19
Walter Reed Army Hospital, Washington, D. C.	15
TOTAL	584
Number of registrations completed	584
Number of examinations conducted	547
Number of retake examinations conducted	38

The report of the auditor which follows indicates that for the year ending December 31, 1953, the American Registry of Physical Therapists continued to operate on a sound financial basis.

AMERICAN REGISTRY OF PHYSICAL THERAPISTS

Report on Examination For the Year Ended December 31, 1953

: May 19, 1954

Board of Registry,
American Registry of Physical Therapists,
30 North Michigan Avenue,
Chicago, Illinois.

Dear Sirs:

We have examined the balance sheet of the American Registry of Physical Therapists as of December 31, 1953, and the related statement of net income and surplus for the year then ended. Our examination was made in accordance with generally accepted auditing standards and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the accompanying balance sheet and statement of net income and surplus present fairly the financial position of the American Registry of Physical Therapists at December 31, 1953, and the results of its operations for the year then ended in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

We submit the following exhibits:

Exhibit
A—Balance Sheet, December 31, 1953.
B—Statement of Net Income and Surplus for the Year Ended December 31, 1953.

Yours Truly,
George Rossetter & Co.

Exhibit A

American Registry of Physical Therapists

(Incorporated in Illinois—Not for Profit)

Balance Sheet, December 31, 1953

Assets

Current Assets:		
Cash on deposit		$23,959.59
Accounts receivable—dues and registration	$ 699.00	
Less reserve for possible losses	325.00	374.00
United States Savings bonds—at cost		35,000.00
Accrued interest		273.21
Total		$59,606.80

Liabilities

Current Liabilities:		
Accounts payable:		
American Congress of Physical Medicine and Rehabilitation	$2,547.13	
Other	606.20	$ 3,153.33
Accrued federal excise tax		75.60
Dues collected in advance —year 1954		14,196.50
Deposits with applications (subject to refund if applications are rejected)		1,730.00
Total current liabilities		$19,155.43
Surplus, per Exhibit B		40,451.37
Total		$59,606.80

Exhibit B

American Registry of Physical Therapists

Statement of Net Income and Surplus for the Year Ended December 31, 1953

Income:		
Dues		$16,118.00
Registration fees		7,002.00
Sales:		
Pins	$ 837.00	
Emblems	449.00	
Directory	253.00	1,539.00
Interest on United States Savings bonds		889.30
Miscellaneous		2.90
Total income		$25,551.20
Expenses:		
Share of office expense billed by American Congress of Physical Medicine and Rehabilitation	$12,000.00	
Printing and multigraphing	1,039.38	
Examinations—supervision and grading	613.40	
Board meeting	143.00	
Purchase of pins	250.00	
Office supplies	715.04	
Special conference	1,660.10	
Postage	187.19	
Office equipment	57.12	
Fidelity bond premium	25.00	
Professional fees	550.18	
Provision for losses on uncollectible dues	726.00	
Purchase of emblems	263.93	
Designing certificate	134.00	
Miscellaneous	2.15	
Total expenses		18,366.49
Net income for the year		$ 7,184.71
Surplus at beginning of the year		33,266.66
Surplus at end of the year		$40,451.37

Respectfully submitted,
AMERICAN REGISTRY OF PHYSICAL THERAPISTS

Dorothea C. Augustine
Registrar

PHYSICAL MEDICINE ABSTRACTS

Physical Medicine and Rehabilitation for the Elderly Neurologic Patient. A. L. Watkins. Geriatrics 9:227 (May) 1954.

In the many neurological disorders arising from degenerative conditions in the elderly, optimum treatment is often effected by use of physical medicine and rehabilitation procedures.

Hemiplegia is probably the most common example of these disorders. Care of this type patient begins as soon as the cardiovascular status has been stabilized. The immediate effort is directed toward regaining function of the involved parts. The first step is institution of passive exercises to all affected joints. Taking the joints through full range of motion several times daily will prevent contractures. Proper positioning of the affected parts is essential for the same reason; this should be taught to the nurses. With the slightest trace of returning voluntary motion or reflexes, neuromuscular reeducation is started. Constant watch must be kept for first signs of phlebothrombosis so that proper measures may be instituted to prevent a fatal pulmonary embolus. Prior to ambulation the patient must have a training period of standing balance and development of muscular strength and coordination in the unaffected side of the body. In addition, he must be evaluated for necessary external support. The parallel bars is the most successful mechanical aid in early gait training. Ambulation on all levels and with least aid follows.

Management of the paralyzed upper extremity is a greater psychological problem than that of the leg, particularly for right handed patients in right hemiplegia. This appears to be due to rigid personality characteristics, making the patient focus on his disability rather than on the possibility of developing new skills with the unaffected extremity. Hence, it is best to start, at a very early date, to develop skill in the left hand. Consultation is advisable regarding proper treatment for return of language function.

Because Parkinson's disease is unrelentingly progressive in character, results of physical medicine are limited. However, omission of certain measures may lead to greater disability, than is necessary. Passive stretching exercises will prevent flexion contractures of the trunk and extremities if performed systematically and regularly. Breathing exercises combined with stretching exercises of the pectoral muscles will maintain maximum chest expansion. Relaxation technics help reduce rigidity and frequently, tremor.

The elderly patient must be watched for signs of pernicious anemia and subacute spinal cord degeneration so that diagnosis may be made and proper treatment instituted. Treatment is purely symptomatic with the aim to maintain maximum muscular function. The prescription is an individual matter depending on the degree of motor and sensory disability and should include external devices as indicated.

Peripheral neuritis with consequent neuromuscular disability is also common in the elderly patients. The usual etiological factor is diabetes. These patients often have painful extremities. The judicious use of heat may relieve this annoying symptom but heat must be used with extreme caution. Passive exercises are helpful in avoiding contractures and are followed by reeducation exercises as soon as voluntary motion is obtained. These patients may be handled much as one with poliomyelitis as far as gait training and use of splints is concerned. The course of degeneration or regeneration of nerve function can be followed by quantitative tests of electrical excitability as performed by a physiatrist in a department of physical medicine.

Non-Articular Rheumatism. R. H. Jacques. Ohio M. J. 50:245 (Mar.) 1954.

Differential diagnosis between non-articular rheumatism and arthritis is often difficult since each has symptoms of pain, stiffness, and tenderness about the joints and presents jelling as an outstanding phenom-

enon. However, in non-articular rheumatism the joints are normal. Rheumatoid arthritis is to be diagnosed only when the clinical syndrome progresses sufficiently to give objective evidence of rheumatoid joint changes.

Primary fibrositis may be either local or generalized, the former favoring posterior neck and paravertebral muscles, the latter involving muscle sheaths, tendons, fascia, and aponeuroses. "Trigger zones" may exist, and cold, dampness and rain usually aggravate the symptoms. The cause is unknown and some object to the concept but it represents a distinct clinical syndrome. The constant objective finding is muscle spasm, and aching and tenderness are produced by prolonged hypertonic action of a muscle.

Subacromial bursitis often results from unusual activity. Rest of the shoulder is advisable in the acute stages. Butazolidin in doses of 400 mg. per day is usually the most effective analgesic. When possible the bursa should be aspirated and then infiltrated with procaine or hydrocortisone and followed with roentgen therapy. Adequate physical therapy must be given to prevent periarticular adhesions.

The shoulder-hand syndrome, the incomplete form of which is known as periarthritis, may follow myocardial infarction, cerebral vascular accidents, painful intrathoracic lesions, or the Parkinsonian syndrome. Rehabilitation largely depends on the institution of active motion with persistent physical therapy and occupational therapy.

Masseter Muscle Hypertrophy. A. B. Kern. A.M.A. Arch. Dermat. & Syph.69:558 (May) 1954.

The diagnosis of hypertrophy of the masseter muscle is readily made by finding the characteristic smooth, nontender, rounded elevation over the angle of the jaw. The region becomes firmer and more prominent on clenching the teeth, and the overlying skin is normal and freely movable. In approximately forty per cent of the reported cases the disorder was bilateral. Some of the patients are asymptomatic and others complain of discomfort or easy fatigability on prolonged chewing.

Differential diagnosis of a mass in this region includes mixed tumor of the parotid gland, salivary retention cyst, adamantinoma, abscess, malignant neoplasms, osteoma, hemangioma, angioneurotics, edema, gumma, tuberculosis, trichinosis, actinomycosis, hematoma, myositis ossificans and congenital wide-angled mandible.

Masseter hypertrophy is generally observed in emotionally unstable persons who frequently clench the teeth. Thoma maintains the cause is inability to masticate food on one side due to loss of teeth or pain from carious teeth.

Wernicke's Encephalopathy. J. M. Nielsen. J. Nerv. & Ment. Dis. 118:429 (Nov.) 1953.

The author emphasizes a correlation of sites of lesions with symptomatology in Wernicke's encephalopathy. Capillary hemorrhages occur in the floor of the third and fourth ventricles, in the periaqueductal gray matter at the oculomotor nuclei, in the mammillary bodies, and in the mesial nuclei of the thalami. It is now clear that lesions around the periaqueductal gray matter in animals produce a state of akinesis with mutism. It is expected that such lesions would have the same effect in the human subject.

A case of Wernicke's encephalopathy is presented showing a selectivity of hemorrhages exactly in the cerebral patterns of conation.

In the early stages of Wernicke's encephalopathy the patient is excited and psychotic. In the late stages he is akinetic and mute, then stuporous and comatose (and death occurs unless vigorous treatment is instituted immediately). Some authors state that polyneuritis invariably precedes this encephalopathy but the writer has seen a number of exceptions to that rule.

Intermittent Positive Pressure Breathing. Its Use in the Inspiratory Phase of Respiration. M. S. Segal; A. Salomon; M. J. Dulfano, and J. A. Herschfus. New England J. Med. 250:225 (Feb. 11) 1954.

The therapeutic value of mechanical respiration in acute and chronic pulmonary diseases, as well as in cardiac conditions, has encouraged the development of many types of apparatus, found largely in the laboratories of physiologists and clinicians interested in pulmonary diseases. The numerous mechanical devices successfully used for pressure breathing include face masks, hood domes and body respiratory chambers, which, depending on the method of application, induce different physiologic responses.

The factors that enter into all types of pressure breathing are as follows: timing of pressure (intermittent—during inspiration or expiration—and continuous—during inspiration and expiration); types of pressure (positive—greater than atmospheric pressure—and negative—less than atmospheric pressure); and site of pressure (airway passages, chest wall and a combination of these sites).

The use of pressure breathing is based on the creation of a pressure gradient from the mouth down to the pleural space. In the in-

spiratory phase in normal persons, positive pressure through a face mask produces mechanical inflation of the lungs similar in some respects to that caused by negative pressure around the thorax by means of the body respirator. At the height of inspiration, however, the pressure built up in the patient's airway is greater than that built up around the body.

In the expiratory phase, negative pressure by mask normally has the same mechanical and physiologic effects on respiration and circulation provided, of course, that these counterforces are of equal magnitude.

Ninety-five patients with different grades of bronchial asthma were treated with or without bronchodilator aerosols. It was noted that the therapy generally helped in this group of patients by diminishing their respiratory distress, as indicated by less wheezing and cough.

Seventy-four patients with chronic pulmonary emphysema, secondary to chronic bronchial asthma in many cases, were treated. These patients showed improvement in color owing to better oxygenation. Cough eased, and expectoration was performed with less difficulty. The breathing pattern became more regular, and exercise tolerance increased.

Twenty patients with bronchiectasis, three of whom previously had lobectomies, were treated. In all cases the end results were very good. There was greater ease of expectoration and an initial increase in the amount of sputum. This decreased as the treatment was continued and cough became less severe. The recurrent pulmonary infections seemed to be more favorably influenced by this form of treatment. The patients showed increased exercise tolerance.

Pulmonary edema due to the inhalation of irritating gases and fumes was rapidly relieved in three patients. Four patients with cardiac failure and pulmonary edema were treated for several hours. Treatment was given for thirty minutes, alternating with twenty-minute rest periods. Results were moderately good during treatment. However, pulmonary edema recurred shortly after treatment was discontinued.

Three patients with chest trauma were treated. They were severely ill and cyanotic, and secretions had accumulated throughout the tracheobronchial tree. Because of pain and the consequent administration of narcotics, the cough reflex was depressed. Aspiration of secretions with a tracheal catheter was ineffective. Treatment appeared to be life saving.

Three patients with respiratory depression from barbiturate intoxication and one with respiratory depression due to a combination of morphine and barbiturates were treated. These patients were in coma, with marked respiratory depression and peripheral circulatory failure. Treatment was given for several hours intermittently until all the toxic effects on the respiratory center had diminished sufficiently to allow the patient to ventilate without mechanical help.

Amyotrophic Familial Spastic Paraplegia. Sigvald Refsum, and S. A. Skillicorn. Neurology 4:40 (Jan.) 1954.

This is a report of an unusual hereditary disorder occurring in three siblings. Beginning between the ages of three and five, it shows the slowly progressive course with the following features: spastic paresis appearing initially in the legs, gradually extending to the upper extremities, and eventually involving lower cranial nerves; the development of progressive, generalized muscular wasting, probably of neurogenic type, during adolescence; marked skeletal deformities; no impairment of sensation or coordination, and normal intelligence. Special studies, including electromyography, electroencephalography and muscle biopsy were performed.

Recent Trends in Classification of Neuropathological Findings in Mental Deficiency. Nathan Malamud. Am. J. Ment. Deficiency 58:438 (Jan.) 1954.

A statistical analysis of the neuropathological findings in 543 autopsied cases of mental deficiency, classifying them under: malformation, destructive processes, metabolic disorders, and neoplastic disorders is presented. The high incidence of congenital malformations relative to the low incidence of the destructive processes is emphasized. Also discussed are the difficulties in clinical diagnosis and recent trends stressing the role of intrauterine factors in the etiology of congenital malformations, particularly those of maternal rubella, Rh incompatibility and congenital toxoplasmosis.

Group Therapy with Preschool Children Having Cerebral Palsy. Ruth Coffman and Ollie Backus. J. Speech & Hearing Disorders 18:350 (Dec.) 1953.

Experimentation with group therapy at the University of Alabama was expanded in 1951 to include a program for preschool children with cerebral palsy. This article constitutes a report of progress with that program. The authors feel that therapy for children with cerebral palsy should be based upon "emotional" as well as "motor" needs and that meeting such needs will influence to a great extent their ability to acquire and use motor

skills. Needs are described and procedures for meeting them are suggested.

Intervertebral Disc Lesions in the Teenage Group. D. R. Lannin. Minnesota Med. 37:136 (Feb.) 1954.

Low back pain and mid-back pain with or without radiating pain into the leg is a fairly frequent complaint of both boys and girls in the teenage group. When a patient complains of lumbar or lumbosacral type pain, one expects primarily to find evidence of some disease, such as tuberculosis, neoplasm or epiphysitis. When a patient in the teenage group, in addition to the back pain, complains of lower extremity radiation, one is highly suspicious of intervertebral disc type lesion.

Many cases of low back pain in the teenage group may have been associated with some minimal type lifting injury or athletic injury which would give rather marked difficulty for ten days or two weeks and then would spontaneously improve on bed rest and symptomatic treatment. A great many of these cases have a tendency to recur periodically but never reach the point of becoming bad enough to justify a spinogram or intensive work-up.

In teenagers as well as adults with disc lesions and with unilateral sciatic radiation, only a small percentage actually obtain much improvement from traction. If traction is to be attempted, it should only be for a trial period and if there is no definite improvement within forty-eight hours it should be discontinued. If, after the period of rest and conservative treatment there has been no improvement or insufficient improvement to allow return to activity, further work-up is necessary. A spinogram is indicated in all these patients to localize more accurately the lesion and eliminate the possibility of an unrecognized double disc.

Nineteen cases of patients came to laminectomy. Eight were girls and eleven were boys, the youngest of whom was sixteen and the eldest had presenting symptoms at the age of nineteen. Eight cases had an L-4-5 defect, ten cases had an L-5-S-1 defect and one patient, a girl of seventeen, had at the same time a large defect at L-5-S-1 on the right and at L-4-L-5 on the left.

In cases in teenagers with complete separation of free fragment discs, the prognosis is probably better than in adults with similar lesions.

Research: A Method of Determining the Maximum Load, for Ten Repetitions, in Progressive Resistance Exercises for Quadriceps Development. Karl K. Klein and Elden Johnson. Journal of the Association for Physical and Mental Rehabilitation 7:4 (July-Aug.) 1953.

The use of progressive resistive exercise for development of quadriceps strength is an accepted technic. The DeLorme method has been responsible for validating this technic and has been instrumental in the development of progressive testing procedures for the administration of the exercise program.

Experimental evidence was collected from six cases demonstrating considerable quadriceps atrophy. Three of the cases were post menisectomies ranging from one to three months post operative before the administration of the program. The other three were muscle atrophy cases resulting from athletic injury.

The tensiometer was used in an attempt to correlate tension strength with the one R.M. lift capacity of the patient. Although no definite conclusions have been obtained, there are indications that a positive relationship can be established between tensiometer tension pound strength and the one R.M. capacity of the patient. With the experimental data available from this study, tensiometer readings have been about three times the one R.M. capacity of the patient.

A Form Used to Evaluate the Work Behavior of Patients. A Preliminary Report. A. Jean Ayres. Am. J. Occup. Therap. 8:73 (Mar.-April) 1954.

It is generally acknowledged that the role of the occupational therapist enables her to make a unique contribution to the vocational well-being of the patient. Just exactly what the contribution can be or is often remains a little nebulous. The need for additional investigation of this aspect of occupational therapy has been expressed frequently.

The occupational therapy department can contribute two types of information that other departments could not. These are the physical capacity of the patient to engage in work activities (particularly from the upper extremity standpoint) and an on-the-spot evaluation of behavior in a work situation.

The work capacity could be deducted from the functional activity records kept on every patient.

A form which the therapist could fill out on the patients scheduled to come before a vocational rehabilitation board seemed to meet the need. The questions listed on the form are chosen because the therapist has an opportunity to observe and judge the behavior trait questioned and also because it was felt the items listed referred to attitudes or habits of vocational significance.

After all the questions have been checked according to the percentage of time, the number of checks in each column is multiplied by the number underneath that column. When these figures are added, a total score

is obtained on the basis of 100 being the score for the person with perfect work behavior.

The Relationship Between Articulation and Other Developmental Factors in Children. Rodney W. Everhart. J. Speech & Hearing Disorders **18**:332 (Dec.) 1953.

An article adapted from a portion of a doctoral dissertation reports an investigation of growth and developmental factors in relation to defective articulation. Factors chosen for study were: onset of holding head up, of sitting alone, of crawling, walking, talking, of voluntary control of bladder, eruption of first tooth, handedness, grip, height, weight, intelligence, reading, arithmetic, and paternal occupation. A clinical analysis of 110 elementary children in grades one to six having articulatory deviations was made and evaluated statistically. A similar evaluation was made of an equal number of children with articulatory patterns within the normal range. From evidence presented in this report, the author concludes that it is reasonable to suggest a positive correlation between low intelligence and articulatory disorders.

The Occupational Therapist as Therapist. Arthur Burton. Am. J. Occup. Therap. **8**:78 (Mar.-April) 1954.

There is a developing trend in the state psychiatric hospital which carries tremendous import for the occupational therapist of the future.

The future status of occupational therapy involves in placing the stress upon the therapist rather than upon the media. Now there is nothing inherently wrong with media. Behavior does not take place in a vacuum and media are needed to stimulate thought and action. However the emphasis on media seems a displacement of curative possibilities inherent in occupational therapy. Patients do not get well because of set perceptual-motor operations but because of human interaction —patient and therapist. A medium serves to bring both together on some common ground and where it becomes an end in itself, it is self-defeating.

Experience indicates insofar as the occupational therapist accepts himself as a professional person doing treatment and his media as merely an adjunct, so is he successful in fundamentally assisting in the maturation of the patient.

If occupational therapists will accept themselves as psychotherapists they can grow and make even greater contributions to the patient's welfare. The results will be contingent upon whether academic and collegiate training centers of occupational therapists recognize these dynamic trends in the psychiatric hospital and plan for them .

BOOK REVIEWS

The reviews here published have been prepared by competent authorities and do not necessarily represent the opinions of the American Congress of Physical Medicine and Rehabilitation and/or the American Society of Physical Medicine and Rehabilitation.

1954 MEDICAL PROGRESS. A Review of Medical Advances During 1953. Edited by *Morris Fishbein*, M.D. Cloth. Price, $5.00. Pp. 345. The Blakiston Company, Inc., 575 Madison Ave., New York 22, 1954.

Both the specialist and the general practitioner will find this volume of great worth in summarizing the high points of advance in the year. Dr. Fishbein has done his usual excellent work of editing and produced a compendium which surpasses the 1953 volume in many respects. Although there is some duplication of subjects by different authors, there is not as much as in the previous volume. Where repetition does occur, it serves to point out a certain principal from different aspects such as warnings on abuses of Cortisone and over-use of antibiotics at the risk of survival of unaffected pathogenic organism.

The subject of cardiovascular surgery, covered as it is from the cardiologists' and surgeons' point of view, is most helpful. Research in nutrition is well covered and practical applications stated concisely. The chapter on Rheumatic Diseases is especially well handled with a summary of present thinking and evaluation of new drugs.

Among the new articles introduced are Physical Medicine by Doctors Frank Krusen and Gordon Martin, and Rehabilitation by Doctor Howard Rusk. Each emphasizes the outstanding research and clinical advances in the field.

For those physicians who wish to keep abreast of the progress of medicine in all fields, this volume is indispensable.

RESPIRATORY DISEASES AND ALLERGY. By *Josef S. Smul*, M.D. Cloth. Price, $2.75. Pp. 80. Medical Library Co., 232 E. 15th Street, New York, 1953.

This little volume, which contains a discussion of the respiratory diseases, is divided into three sections: Allergic Diseases of the Respiratory System; Infectious Diseases of the Respiratory System, and Neoplastic Diseases of the Respiratory System.

Section I presents a new approach to a group of respiratory diseases which the author chooses to classify under one head labeled Respirallergy. In this group 22 different conditions are listed and which he feels are primarily allergic. The group includes hay fever, asthma, vasomotor rhinitis, acute recurrent rhinitis, sinusitis and bronchitis, acute recurrent supperative rhinitis, sinusitis and bronchitis, chronic atopic rhinitis, sinusitis and bronchitis, and bronchiectasis, to name some of the conditions mentioned.

Management of respirallergy consists in prophylaxis by protection from allergens which have been shown to be etiologic factors as determined by diagnostic study. Treatment is by means of desensitization to specific allergens. If this fails, the author employs Cortisone with large initial doses, reducing rapidly to a 100 mg. daily maintenance dose. This is usually given for one to two weeks during the period when the allergen is active. In chronic intractable respirallergy, more prolonged use of Cortisone may be necessary. The author mentions the usual cautions regarding the side effects of Cortisone.

Section II of the volume contains very concise discussions of the respiratory infections which do not differ materially from those found elsewhere. Section III consists of a very brief general discussion of respiratory neoplasms which does not go into detail on the individual lesions.

This monograph on the respiratory diseases should prove interesting to those concerned with allergy as related to the respiratory tract. Aside from this, there is nothing unusual presented.

HYPNOTISM: AN OBJECTIVE STUDY IN SUGGESTIBILITY. By *Andre M. Weitzenhoffer*. Cloth. Price, $6.00. Pp. 380, with 7 illustrations. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16; Chapman & Hall, Ltd., 37-39 Essex St., Strand, London, W.C. 2, 1953.

The author of this book is a physicist and mathematician as well as a psychologist. His

is a very creditable attempt to scrutinize the phenomena of hypnotism as one would any other physiological or psychological phenomenon. He succeeds to a considerable degree. His premise is that all the phenomena seen in hypnosis can be seen in some degree in normal waking behavior and the differences are largely quantitative ones rather than qualitative. This conclusion is certainly supported by electroencephalographic tracings made during natural sleep and hypnosis. The author has exhaustively reviewed all the really pertinent and well written literature on the subject. His presentation of this thesis is divided into his study of the experimental approaches which have been made and a theoretical formulation derived by the method of induction from this experimental basis. In the concluding section of the book, the author briefly discusses the historical theories of hypnosis and considers their weaknesses. The author then presents his own theory which seems well founded on the experimental data. He attempts to reduce the phenomenon of hypnosis into primary, secondary and tertiary suggestibility. The differences cannot be gone into here but seem logical and well constructed.

On the debit side, the author has an irritating habit of resorting to footnotes on every page. Otherwise he writes well. Some of his discussion of neurophysiology seems somewhat naive and rather like a popular exposition of the subject.

The author does not go into practical applications. As a matter of fact, this aspect of the question is quite unnecessary at this stage of knowledge. However the reviewer cannot help wondering to what extent hypnotic behavior does not participate unwittingly in daily life: in the administration of drugs; in political harangues; in inspirational evangelical religious gatherings; in door to door salesmanship; in physical and occupational therapy. To what extent can autohypnosis reinforce resistent behavior patterns? Leaving psychiatric syndromes completely aside, to what extent could we make a better use of hypnotic technics in the ethical treatment of physical disabilities, for example? I have considered this question before and usually rejected it on the ground that hypnosis is extremely time-consuming and that the patient on whom you most wish to use it may turn out to be relatively refractory.

This book is recommended only for the student of the little-explored corners of psychology. As noted once by Dr. Janet Travell, a similar logical analysis of the phenomena of hysteria must some day be made and must certainly turn out to be like hypnosis, manifestations of degree rather than a kind of ordinary behavior and having a quite physiological, if reversible basis.

THE MUSCULOSKELETAL SYSTEM. Edited by *Mahlon Ashford*, M.D. Cloth. Price, $6.50. Pp. 368, with illustrations. The Macmillan Company, 60 Fifth Avenue, New York 11, 1952.

This volume is one of a series presenting the results of an annual symposium held under the sponsorship of the New York Academy of Medicine. The title implies a homogeneity lacking in the text, and this is to be expected, for the designation "musculoskeletal system" in itself covers a tremendous portion of medicine.

The symposium covers the chemistry of connective tissue, skeletal changes associated with diseases of the blood, tumors of bone and joints, the collagen diseases and a variety of other topics. The subject treatment in most cases is very adequate, but one wonders at the scope of interest required in the prospective reader.

Still, medicine more and more, becomes difficult to segmentalize into rigid and independent categories. Certainly, the practice of physical medicine, embracing as it does the care of paraplegia, poliomyelitis, multiple sclerosis and a variety of other diseases, many of which if not all, have metabolic overtones, requires greater knowledge of physiological, chemical and pathological principles.

There is something in each of these collected essays of interest to us. Discussion of connective tissue, collagen and cortisone, as well as detailed descriptions of rheumatoid arthritis and pyogenic arthritis are pertinent to our interest in the arthritides. All in all, this is a volume which should prove profitable to the reader who is able to reason from published facts.

LESIONS OF THE LUMBAR INTERVERTEBRAL DISC WITH SPECIAL REFERENCE TO RUPTURE OF THE ANNULUS FIBROSUS WITH HERNIATION OF THE NUCLEUS PULPOSUS. By *R. Glen Spurling*, M.D. Cloth. Price, $4.75. Pp. 148, with 45 illustrations. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill.: Blackwell Scientific Publications, Ltd., 49 Broad Street, Oxford, England; Ryerson Press, 299 Queen Street, W., Toronto 2B, 1953.

This monograph is a lucid and concise presentation of the lumbar intervertebral disc with emphasis on rupture of the annulus fibrosis and herniation of the nucleus pulposus. The material is factual and based largely on the military and civilian experiences of the author. It represents the sober thinking and judgment so necessary to stabilize the approach to the herniated disc and place it in the category of a definite clinical entity with a temperate plan of treatment.

Dr. Spurling first presents the embryology and anatomy of the lumbar disc which is essential to an understanding of the pathology. He defines the lesion—a tear in the posterior annulus fibrosis through which nucleus pulposus herniates into the spinal canal. Ninety-five per cent of all lumbar disc lesions occur at either the fourth or fifth interspace.

The trauma of everyday life such as bending, lifting and twisting are held responsible for the initiation of a tear in the annulus. Repair of the rupture may occur but the nucleus undergoes degeneration without regaining its elasticity. Contrary to the earlier teaching of Dandy, the author found multiple disc lesions in only 1.3 per cent of his operated cases.

Herniation of the nucleus may cease to be painful if the nerves involved in the process undergo physiological destruction. Attention is called to the need for adequate testing of motor function rather than relying entirely on sensory defects. The various special tests are discussed and illustrated. The author feels that rupture of a disc is the most common cause of low lumbar pain with or without sciatic radiation. The diagnosis is made largely on the basis of clinical findings with myelography limited to special indications where the symptoms preclude adequate localization as might be the case in a midline herniation. Lumbar puncture is performed as a differential diagnostic procedure.

Therapy is often difficult to evaluate because of the natural course of the disease with periods of spontaneous remissions. Every patient should have the benefit of conservative therapy unless the neurological findings are extensive. Heat and exercises are considered of symptomatic value during the conservative phase. Massage often exaggerates the pain. Immobilization with a brace is considered feasible. Manipulation must be used with the utmost discretion, if at all, as it may only complete a rent in the annulus fibrosis hastening herniation of the nucleus. Surgery is indicated where the sciatic radiation is intense enough to disable the individual completely. It is normally an elective procedure. The patient as a whole must be evaluated, especially in compensation cases. The author does not consider spinal fusion as a primary procedure or as a routine adjunct to disc surgery. No specific post-operative back exercises are discussed or recommended.

In the author's series, no spine fusions were performed. About eighty per cent of all operated cases were considered successful. The good results are attributed to the careful selection of cases and better operative technic.

FACIAL DEFORMITIES AND PLASTIC SURGERY: A PSYCHOSOCIAL STUDY. By *Frances Cooke MacGregor*, M.A., et al. Cloth. Price, $5.75. Pp. 230, with illustrations. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill.; Blackwell Scientific Publications, Ltd., 49 Broad Street, Oxford, England; Ryerson Press, 299 Queen Street, W., Toronto 2B, 1953.

Facial disfigurement and facial deformities are accompanied by some degree of emotional reaction. A psychiatrist, two psychologists and two sociologists have combined their resources to study this problem.

Case histories of four types of facial deformity are reported. The life history of the patient is reviewed and his reactions, along with the reactions of his family and associates to the disability are recorded. The full meaning of facial deformity to the patient and his family is carried within the text of the case histories. The histories of these four patients and other patients are analyzed by the authors from the standpoint of psychosocial aspects, the family, psychological aspects and psychiatric aspects. It is in these chapters that the experience of the authors is manifest and their interpretations and doctrines are offered. There are some minor differences of opinion, but there is definite agreement that although much is being done for the facially deformed, much more must be done. The team approach in the management of facial disfigurement becomes obvious.

The book explains various degrees of deformity by means of photographs. There are helpful tables in the appendix showing distribution of patients by age and sex; type and severity of deformity; origin of deformity and age at onset. Another appendix presents psychological data. There is a selected bibliography.

This manual is of extreme general interest and should be available to all workers in the numerous disciplines who work with people who have facial disfigurements.

LEADERS IN AMERICAN SCIENCE. An Illustrated Biographical Directory of Eminent Leaders in Research, Industrial, Governmental, and Educational Scientific Fields in the United States and Canada. *Robert C. Cook*, Ed.D., Editor-in-Chief. Miss *Eleanor Carroll* (Sophia Newcomb), Associate Editor. First edition (Vol. I, 1953-54). Cloth. Price, $12.00. Pp. 703. Who's Who in American Education, Inc., 110 Seventh Ave., N., Nashville, Tenn., 1953.

This book contains much valuable and interesting information, including more than a thousand photographs, relating to scientists of the United States. The difficulties confronting the editors of such a book are sketched in a frankly worded preface and are manifest everywhere in the text. Among them are the extremes of diffidence in some scientists and of vanity in others, so that one receives a notice of two lines saying that he is an anatomist, while another fills a column

and a half with irrelevant items, including the information that he belongs to the Society for the Preservation of Covered Bridges. Although the Preface deprecates the idea that this is a "vanity volume," something more needs to be done if the suspicion is to be allayed, namely to define more carefully what sort of information is essential to a scientific directory, to eliminate details that make a propositus look conceited, and to list more of the self-effacing teachers, scholars, and research-workers who supply the ideas and data for others to exploit.

REHABILITATION OF THE PHYSICALLY HANDICAPPED. By *Henry H. Kessler*, M.D. Second edition. Cloth. Price, $4.00. Pp. 275. Columbia University Press, 2960 Broadway, New York 27, 1953.

This book is a revision of the original text by Dr. Kessler who has had over thirty years' experience in rehabilitating the physically handicapped. He has written new material on the rehabilitation of wounded veterans, on vocational guidance, on vocational training and placement and developments in rehabilitation programs that have occurred since 1947. Recent statistics on rehabilitation are cited throughout.

The first part considers the problems of the crippled child, the injured worker, the disabled veteran, and the chronically disabled. The second portion is concerned with the basic principles of rehabilitation in terms of physical restoration, rehabilitation centers, vocational guidance, vocational training and job placement. The third section deals with rehabilitation problems occurring in the mentally and emotionally disabled, the orthopedic patient, the blind patient and medical and surgical invalids. A final section of the book contains a discussion of legislation and administration in relation to a national program of rehabilitation. A directory of major centers and agencies for the handicapped is given. This book is recommended to all interested in the broad field of rehabilitation and to the handicapped themselves.

ATLAS OF ORTHOPEDIC TRACTION PROCEDURES. By *Carlo Scuderi*, M.D., Ph.D. Cloth. Price, $12.50. Pp. 230, with 124 illustrations. The C. V. Mosby Company, 3207 Washington Ave., St. Louis 3, 1954.

In the preface of this book, the author states the "purpose of this book is to fill a definite gap in orthopedic literature by photographs, line drawings and simple descriptive language, presenting an 'Atlas of Orthopedic Traction Procedures.'"

The book illustrates in simple yet complete detail how to set up an orthopedic traction; an estimate of basic requirements for hospital orthopedic traction equipment is given; the care of the skin, care of skeletal traction and care of the patient are discussed. Hospital beds, mattresses, overhead frames and the various types of traction for the cervical spine, upper and lower extremities and spine are discussed and illustrated by line drawings and photographs. The illustrations are clear and concisely demonstrate the necessary features.

This type of book should facilitate the teaching of students, interns and residents in orthopedic services. It should also be helpful to the nurses and physical therapists who care for these patients.

SALT AND THE HEART. By *Edward T. Yorke*, M.D. Cloth. Price, $3.45. Pp. 83, with illustrations. Drapkin Books, 36 E. 19th St., Linden, N. J., 1953.

In this monograph for lay readers, Dr. Yorke presents a brief survey of the physiologic and some of the pharmacologic considerations in the treatment of congestive heart failure. With the help of a few sketches and tables, the subject is covered fairly well without the use of obscuring technical language. The text should prove useful to practitioners too busy to give their patients full instruction in the management of congestive heart failure.

PATHOLOGY. Edited by *W. A. D. Anderson*, M.D. Second edition. Cloth. Price, $16.00. Pp. 1393, with 1241 illustrations and 10 color plates. The C. V. Mosby Company, 3207 Washington Blvd., St. Louis 3, 1953.

Pathologists throughout the country have combined their knowledge under the able leadership of the editor, Dr. W.A.D. Anderson, to produce an outstanding presentation of the current science of pathology. Specialized workers in all phases of this subject have summarized a vast field in such a format that the practitioner and the medical student alike can find succinct information about any phase of this basic subject quickly and in readable form.

Essential facts about any pathological process can be found in the portions of the text in larger face type, and more detailed material is presented in smaller type for the advanced student or physician who seeks additional information or references. The sections dealing with effects of physical energies and radiation, also those which treat of the diseases of the joints, muscles and the nervous system, are particularly useful to physicians specializing in physical medicine and rehabilitation. No attempt has been made to form

an encyclopedia of pathological subjects, but good editing has resulted in a collection which omits surprisingly few of the basic facts.

It is refreshing to see the tendency toward reduction of eponyms in this text. Diseases which have related manifestations have rightly been combined under one heading, and anatomical names or designations which indicate a common relationship have been used. The dynamics of tissue growth, as illustrated by the multitude of workers through tissue cultures and experimental technics, have been well presented, and the phenomena of inflammation, which are also exceedingly well described in this volume, should form the basis of the thinking of every physician.

PSYCHOSOMATIC CASE BOOK. By *Roy R. Grinker*, M.D., and *Fred P. Robbins*, M.D. Cloth. Price, $6.50. Pp. 346. Blakiston Company (division of Doubleday & Company, Inc.), 575 Madison Ave., New York 22, 1954.

A case book which gives specific examples of psychosomatic disturbances and suggests the psychiatric technics for relief or even cure should be a useful reference source for the busy doctor. The authors attempt to introduce the reader to the complexities of psychosomatic medicine through a review of actual cases which illustrate all the special syndromes relating to the various systems, from the head and special sense organs to the musculoskeletal system and the skin. General considerations and modern theoretical concepts include a chapter on anxiety, in which the authors quite rightly point out the fact that anxiety is not only an internal state of foreboding akin to fear, but may be an expression of shame feelings, or guilt feelings. The defenses with which individuals attempt to meet anxiety are well chosen and informative.

Problems of diagnosis, differential diagnosis and formulation of case problems are approached from the viewpoint of the psychoanalyst, as are the suggested planning and technic of therapy. This is the natural approach for psychiatrists of analytical tradition, and it offers much food for thought for the general practitioner and the specialist in physical medicine and rehabilitation. Reactions to the therapeutic situation with respect to physical methods and especially the complex problems of rehabilitation, with the great need for acceptance and motivation, are certainly no different in quality than the reactions a patient might have to a dietary regimen or surgery.

The physiological approach to psychosomatic disorders is not ignored, but somatic problems are naturally subordinated to the psychic factors by the authors. It may be that organic manifestations of such diseases as multiple sclerosis are too easily supposed to be "a regression to helpless infancy." Since personality structure is so basic in medicine, this suggestion, like the entire book, is thought-provoking.

PRACTICAL METHODS IN BIOCHEMISTRY. By *Frederick C. Koch* and *Martin E. Hanke*. Sixth edition. Cloth. Price, $5.00. Pp. 537, with 28 illustrations. Williams & Wilkins Company, Mount Royal and Guilford Avenues, Baltimore 2, 1953.

This volume is essentially a well planned laboratory manual, intended for medical students. In it are included laboratory methods and related information concerning biological chemistry. Both qualitative and quantitative methods are described, including the chemistry of cell constituents, chemistry of the digestive tract, blood and urine, enzymes, vitamins and hormones.

It appears to this reviewer that the text would be most suited for an instructor, as a guide for laboratory work in this field. It would also be a valuable reference text for a research biochemist working in the biological sciences.

The illustrations of apparatus and technics are clear, but for a medical student it would seem that a greater number and variety of illustrations, with perhaps a fewer number of experiments, would have been of greater value. In this regard it may be noted that in the sixth edition there are more than three hundred experiments, described in detail. An appreciation of the limited time which medical students have available in the biological chemical laboratories would make this seem a bit too voluminous for their needs.

The authors should be commended for compiling an excellent reference text in practical biochemical methods.

THE CUTANEOUS MANIFESTATIONS OF SYSTEMIC DISEASES. By *John Goodwin Downing*, M.D. Cloth. Price, $4.25. Pp. 146, with 52 illustrations. Charles C Thomas, Publisher, 301-327 E. Lawrence Avenue, Springfield, Ill.; Blackwell Scientific Publications, Ltd., 49 Broad Street, Oxford, England; Ryerson Press, 299 Queen Street, W., Toronto 2B, 1954.

This is a concise compilation of the lectures given to the medical students at Tufts Medical School and Boston University School of Medicine. The author shows how most dermatoses are actually cutaneous reflections of systemic pathologic processes. It is certain that when physicians recognize and correctly diagnose the many skin diseases, the better

the care will he be able to give his patients.

This book should be valuable to all physicians and students. The illustrations are profuse. It is regrettable that color plates are not included in the text.

MAN'S BACK. By *Theodore A. Willis*, M.D. Cloth. Price, $9.50. Pp. 161, with illustrations. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill.; Blackwell Scientific Publications, Ltd., 49 Broad St., Oxford, England; Ryerson Press, 299 Queen St., W., Toronto 2B, 1953.

Books on the back are numerous. Here is a relatively small book that contains a wealth of information. The author has been studying the back for many years. One of his earliest publications on the anatomy of the back is a classic.

The first part of the volume considers the embryology, anatomy, anomalies and mechanics of the back. In fifty pages, these subjects are most adequately covered. The illustrations are superb. The chapter on examination of the back is clear and concise and would be most helpful in establishing a diagnosis.

Three chapters are devoted to injuries, diseases and tumors. In discussing the rheumatic diseases, the author stresses the "toxic substances" and the "deficiency in liver function and in detoxification of the products of protein decomposition." This theory has been investigated by others and has not been accepted generally. His method of treatment by Crowe's vaccine too, would be questioned by many rheumatologists with wide experience in the use of this vaccine. His concept of the reasons for the use of cortisone in a book bearing a 1953 publication date hardly seems warranted.

The chapter on physical therapy is straight forward and covers the important measures that are used. The few words about occupational therapy and rehabilitation are a bit vague and might better have been omitted. The many illustrations of specimens and x-rays are most unusual. They are exceptionally well chosen and clearly reproduced.

AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS INSTRUCTIONAL COURSE LECTURES. Volume X. Editor: *Charles N. Pease*, M.D. Cloth. Price, $12.00. Pp. 439, with illustrations. J. W. Edwards, 1745 S. State St., Ann Arbor, Mich., 1953.

These volumes are one of the finest contributions of the American Academy of Orthopaedic Surgeons. The papers selected for publication present the latest information on the advances in this specialty. The authors are certainly the outstanding orthopedists.

Chapter I is on fractures with the following bones discussed: Wrist, femur, hip and pelvis. The various operative procedures are presented. Chapter II uses a new term "Traumatic Arthrofibrosis" in which is described the traumatogenic destructive fibroplasia leading in severe cases to fibrosis or bony ankylosis. Discussion of this new syndrome warrants attention. The author of this chapter advises "the sooner immobilization can be dispensed with and active motion started, the better for the health of the involved joints" will meet with hearty approval.

The chapter by Dr. Ruth Jackson on the Cervical Syndrome is excellent. In a very concise manner, a great deal of information is given on the anatomy, etiology, diagnosis, signs and symptoms of this disorder. This chapter alone justifies securing the volume.

Another complete and stimulating chapter by Dr. Williams of Texas is on the Conservative Management of Lesions of the Lumbosacral Spine. The suggestions for exercises, bracing, and positioning should be helpful to many physicians. Chapter IV contains three papers on Congenital Deformities with the longest section on primary and secondary deformities in which many abnormalities in various parts of the extremities are considered. The other two papers are concerned with congenital dislocation of the hip in infants and club feet.

A chapter on progressive resistance exercises has several new ideas in their use in postoperative cases. Ergograms are employed to demonstrate certain changes.

Another paper deals with the structural and functional features of the diarthrodral or synovial joints in which the anatomical changes are correlated with the joint symptoms and objective findings.

The fundamental principles of braces by outstanding authorities are given in five short sections. Doctor Irwin has the section on poliomyelitis, Doctor Thomas on the spine and Doctor Phelps on cerebral palsies.

A section on the foot covers many interesting conditions. Doctor Lenox Baker has the first paper on Diseases of the Foot. He expresses the opinion of many physicians who attempt to help these patients with functional therapy. He states "Undoubtedly, an occasional patient will cooperate in a functional program, but in the large majority of cases, there is little cooperation." His ideas on many conditions which are frequently encountered such as plantar warts, bursitis, metatarsalgia and others are practical and up to date. Doctor William Green has a concise and valuable chapter on the operations to improve the functions of the paralyzed foot by arthrodesis, bone blocks and ankle fusion.

A paper from the Kennedy VA Hospital in Memphis, Tenn., considers the rehabilita-

tion of the post-traumatic paraplegia in which the cooperative efforts of all departments of the hospital are utilized. It is comforting to see that the services from the Department of Physical Medicine and Rehabilitation are given credit for their contributions. Doctor Street, the author of this paper, definitely understands the complexity of the problem and shows what the comprehensive form of care can accomplish. He can speak with authority since 612 patients were admitted from 1946 to 1950 and from 1950 to 1952, an additional 373 patients were reviewed.

Other interesting papers and chapters are included in this book. This is the type of work that should be of inestimable value to every one who cares for patients with bone and joint disorders.

In the foreword, Dr. Charles N. Pease tells of his retirement as editor of these volumes. He did a superb job for the past four years. Many physicians are certainly grateful for his efforts.

EFFECTIVE INHALATION THERAPY. By *Edwin Rayner Levine*, M.D. With cooperation of: *Alvan L. Barach*, M.D., *J. Winthrop Peabody*, M.D., and *Maurice S. Segal*, M.D. Cloth. Price, $4.50. Pp. 159, with illustrations. National Cylinder Gas Company, 840 N. Michigan Ave., Chicago 11, 1953.

This is an excellent little book which should be used by physicians as well as medical technical personnel as a manual. It explains in the simplest terms the physiologic principles of respiration. It discusses very briefly and schematically, but still in a satisfactory way, the pathology of diseased states in which inhalational therapy is indicated. Technical advice is given on how to use inhalation in various respiratory and other diseases. Necessary precautions are emphasized. If inhalation therapy is ancillary to other measures, these are mentioned.

The text is made easy to follow, to understand and to remember by a multitude of excellent drawings. Chapters on apparatus and technics and a glossary of terms will be welcome additions especially for medical personnel.

The clarity and conciseness of the book and the amount of factual information in it make a very valuable contribution to the field of inhalation therapy.

THE PRACTICAL MANAGEMENT OF DIABETES. By *Edward Tolstoi*, M.D. Cloth. Price, $3.25. Pp. 93. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill.; Blackwell Scientific Publications, Ltd., 49 Broad St., Oxford, England; Ryerson Press, 299 Queen St., W., Toronto, 2B, 1953.

Dr. Tolstoi's opinions on the management of diabetes are well known. They have been for several years and still are a matter of discussion among diabetologists and internists. Probably the majority of experts disagree with the author on the success and long range safety of his method. As outlined in this small volume, the purpose of Dr. Tolstoi's regimen is the "elimination of all diabetic symptoms" including a "strict avoidance of Ketonuria" and a "restoration of the patient to social and economic usefulness." No one would argue against the goals. This is obtained with "a self-selected, unmeasured and unweighed diet and one dose of slow acting insulin" and under "disregard of glycosuria" and blood sugar. Many diabetologists are unable to achieve these results regularly and fear the late complications of diabetes without so-called "strict control."

Discussed schematically and sometimes dogmatically is the treatment of the diabetic under average conditions and with complications like infections, surgery, acidosis. Also mentioned are peripheral vascular diseases and neuropathy, and their possible relation to the control of diabetes.

The book is interesting and stimulating. It cannot be recommended as the sole or main source of information for those not familiar with the care and problems of diabetes.

A CIBA FOUNDATION SYMPOSIUM: THE SPINAL CORD. Editor for Ciba Foundation: *G. E. W. Wolstenholme*, O.B.E., M.A., M.B. Consulting editors: *J. L. Malcolm*, M.B., Ch.B., B.Med.Sc., and *J. A. B. Gray*, M.A., M.B., B.Chir. Assisted by *Jessie S. Freeman*, M.B., B.S., D.P.H. Cloth. Price, $6.50. Pp. 300, with 112 illustrations. Little, Brown & Company, 34 Beacon St., Boston 6, 1953.

This is a collection of papers presented by some of the leading English scientists following the meeting of the Royal Society and the Physiological Society in 1952. Theodore H. Bulloch presented his comparative studies on the cord of animals, in which he discussed (1) two-way transmission at unpolarized synapse; (2) the decussation with functional meaning, which make synaptic contacts between bilaterally homologous pathways, and (3) the role of the synaptic potential.

D. H. Barron presented his observations on some factors regulating the form and organization of the motoneurons of the spinal cord. His studies, though limited, indicate that (1) the columnar arrangement of the motor cells is related to central intra-cordal circumstances and not to the pattern of the peripheral musculature; (2) that the time of the first appearance of dendrites is deter-

mined by events at the muscle-axon junctions, but their direction of growth is determined by intra-cordal forces, and finally, (3) the number of motor cells supplying any particular limb appears to be determined by the muscles of that limb, by regulation of the number of motor neuroblasts that finally differentiate. These studies were conducted on pre-motile chick embryos. The motor cell groupings of the spinal cord were discussed by G. J. Romanes.

A series of articles on electrical conductivity of spinal cord and root potentials and reflex responses, was presented by a number of investigators. Of special interest are the reports of Broch, Coombs and Eccles, on antidromic propagation of impulse into motoneurons; and of Lorente de Nó on conduction of impulses in the neurons of the oculomotor nucleus.

Included in the symposium are reports on experimental use of various drugs to stimulate certain responses in spinal cord.

From clinical medicine the article of Donal Brooks on Nerve Conduction in Poliomyelitis is excellent, as it presents possible explanations for recovery of affected units. He states that the problem in poliomyelitis was to find a means of assessing early in the disease the prognosis of paralyzed muscles. He used three methods of investigation, that is, the strength (intensity) duration curve, electromyography and nerve conduction. Each method has certain disadvantages when used clinically. However, he believes that the nerve conduction method is the best for this purpose. By nerve conduction, he means the percutaneous stimulation of the main nerve to a muscle or group of muscles with an electrical stimulus of relatively short duration (1-10 milliseconds). The presence of a significant number of intact motoneurons is demonstrated by visible strong or weak contraction or, when all have perished, no contraction at all. In clinical work, this method has the advantage of being relatively painless by reason of the character of the stimulus; moreover, it is quickly and easily performed. The sole disadvantage is that the nerve must be superficially placed.

Brooks believes that some of the clinical features which occur in poliomyelitis cannot be accounted for on the basis of anterior horn cell destruction alone. It would seem that a disturbance of the normal neurophysiological process in the cord and possibly in peripheral axons plays an important part in determining the extent of the initial paralysis and the degree of recovery that subsequently occurs.

This symposium will be of great use to the research work in basic neurophysiology. For clinical purposes, except for a few articles, it has too many preliminary experimental data to be of value in every day application.

PRACTICAL PHYSICAL THERAPY. *Joseph E. G. Waddington*, M. D. Cloth. Price, $7.50. Pp. 280. Published by author, Detroit, Mich., 1953.

Books like this have value in showing by contrast how much progress has occurred. Although dated 1953, the advice and information that is given was that frequently found in books which were published many years ago.

Irrational and unscientific applications of physical therapy are advocated and the following examples are cited: In the chapter on Electrolysis—ionization, the statement "To improve the nutrition and circulation within the brain in cases of 'brain fag,' cerebral endarteritis, premature impairment of the mental faculties, vertigo, chronic headache, and various other symptoms apparently dependent upon an impaired cerebral circulation, mild applications of the constant current directed through the brain have been recommended" is made; also in this chapter is the statement "The constant current will easily pass through the thinly covered skull and traverse the succulent tissues therein contained, as it is the greater conductivity of generously overlying soft tissues that conduces to less current penetration through bone."

In the chapter entitled "Scientific Thermal Therapy," many words are used but no specific or useful instructions are given. Statements such as "The reciprocatingly antagonistic reflexes which physiologically constitute the heat-regulating mechanism are intricately and delicately controlled by many factors;" "In appraising temperature it should be critically understood that the thermometer is not a precise indicator of the amount of thermal activation within the body; an increased thermometer reading may be indefinitely indicative of either increased heat production or of decreased heat dispersion;" "Too often thermal therapy is so parsimoniously and hesitantly administered as to be therapeutically worthless. A pneumonia patient may not infrequently require a half-hour or more of heat treatment, repeated every four hours," are difficult to understand.

Two pages are devoted to "Electro-surgery" and the final paragraph is herewith quoted: "The reaction after any of these electro-surgical procedures is astonishingly free from pain and shock; and it is surprising to the uninitiated to see how quickly a large operative area will shrink to almost negligible proportions, compared to the original size of lesion, and contrastively with the cicatrix resultant to a cutting operation. Some simple protective dressing is all that is ordinarily required. After the slough or crust separates, ultraviolet radiation may be applied as convenient, to obviate possible infection during the healing process."

Twelve pages of text are devoted to "Scientific Intestinal Irrigation," which may indicate the importance attached to this form of therapy. The following quotations are examples of the evaluation of colonic irrigation as set forth in this publication: "The intestinal irrigation technician must be as familiar with the anatomy and physiology, especially the autonomic nervous system, of the entire intestinal canal, as the experienced automobile driver becomes with the mechanism of his car and, in addition, be one who recognizes the various directive signs and topography of his road and road map." "The next day, with no voluntary stool intervening, a repetition of the irrigation will not infrequently surprise the patient, and any accompanying friend or relative, with the tremendous outpouring of old debris." In addition to this therapy, another modality is recommended as follows: "Preparatory to any irrigation the patients should completely disrobe and wear a treatment gown, like a hospital garment, opening in the back. This permits unobstructed access to the region involved and with no possibility of any untoward spilling of fluid upon the patient's clothing. Also, the operator is thereby enabled to examine the abdomen visually and manually, as may be indicated during the irrigation and, if deemed necessary, to apply a sinusoidal (A.C.) application or vibration to the spine at the conclusion of the irrigation." As if this were not enough, the last chapter in the book is labeled "Philosophy of Intestinal Irrigation." A few of the more choice bits of philosophy included are "Josh Billings is responsible for the unesthetic but practical conclusion that of the three, a healthy regularly acting set of bowels is of more value to a man or woman than a generous supply of brains or a handsome figure;" "Instead of poetically invoking the stars it will more profitably serve one's health prosaically to come down to earth and investigate the therapeutic possibilities of scientifically applied intestinal irrigations, such intestinal ablutions, more often than not, will satisfactorily dispose of much 'earthly soil' "; "Therapeutically, as well as Biblically, the first shall often be last and the last not infrequently be first. Neither the inlet nor the outlet is anatomically or logically to be considered of superior importance to the other," and "Finally, those unfortunates who complain of lack of results from intestinal irrigation might do well to recall Elbert Hubbard's estimate of matrimony 'The reason that matrimony is a failure in so many cases is because people are trying to get more out of it than there is in it.' "

The text contains a chapter on plasmatic therapy in which is stated "Plasmatic Therapy may aptly be termed a Miracle Therapy and without the least danger of an allergic or serious result — if expertly applied and supervised." Another statement which will amaze the scientific physician reads "It makes no material difference what particular ailment the patient is suffering from that is suitable for Plasmatic—the end recovery is dependent on Organic stimulation. The exact diagnosis for the condition therefore has very little—if any—influence on the application of the treatment method, the patient's recovery being dependent upon the patient's own natural resistance and the immunity processes set in action by Plasmatic therapy sessions."

It is further indicated in the text in the statement "Let me emphatically state from many years of experience with Plasmatic Therapy, that this form of treatment will pre-eminently assist in arresting further deterioration of body cells and will inject a more normal active life force into the physical organism." It would seem that from a comment in the preface of this book one should "constructively and concisely criticize such ideas and technics which are illogically, inconclusively, yet popularly, believed in and practiced to the retardation of scientific physical therapy thought and action" was not followed in the text. Evidence of scientific evaluation for this therapy is entirely lacking. Physiological phrases are used but without specific confirmation.

A chapter on Selective Technics for various diseased conditions begins with "abscess" and ends with "warts." Included in the recommendations are the following:

Adenomata: "Apply the rapid faradic or rapid A.C. as advised under *Fibroid: Uterine.*"

Anaphrodisia: "Gentle vibration with a prostate or rectal vibratode for five or ten minutes is satisfactory treatment, with or without any preceding thermal application."

Asthma, Cardiac: "Lateral vibration between the transverse processes of the 7th cervical and the 1st dorsal vertebrae, for five to ten minutes at a time."

Diabetes Mellitus: "Mild short wave diathermy is particularly indicated, with an electrode over the liver and pancreas and a larger one posterior; or the drum may be more conveniently positioned over this anterior area."

Myocardial Insufficiency: "Vibratory percussion; apply to the interspaces between the 7th cervical and the 1st thoracic vertebrae for three to five minutes, with equal rest intermission every one or two seconds."

Sterility: "Short wave ultraviolet radiation of the vaginal canal."

Although date of publication is 1953, the latest reference is 1939, which is to an article by the author. As was implied in the opening portion of this review, the practice of physical therapy has made great strides beyond the opinions as expressed in this book.

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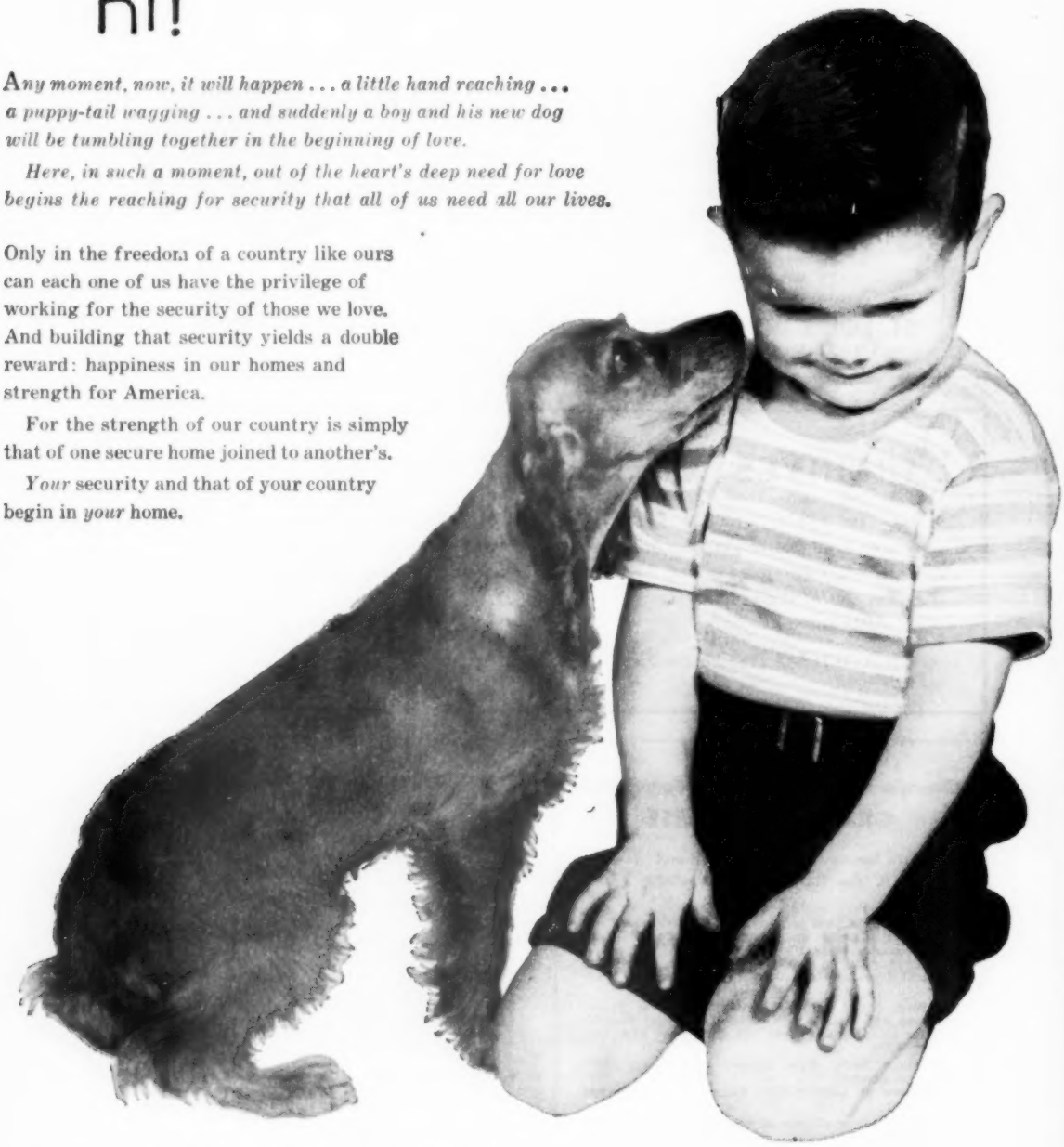

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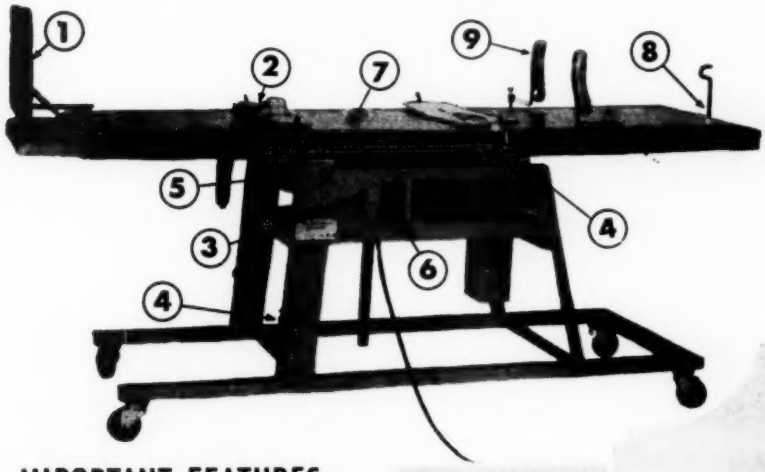

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HEMIPLEGIA

Tuesday, September 7

9:00 - 9:50 A.M. PHYSIOLOGY OF CEREBRAL CIRCULATION. **Seymour S. Kety, M.D.,** Bethesda, Md.

10:00 - 10:50 A.M. ANATOMY OF CEREBRAL CIRCULATION. **Othmar Solnitzky, M.D.,** Washington, D.C.

11:00 - 11:50 A.M. ACUTE MANAGEMENT OF HEMIPLEGIA AND PREVENTION OF DEFORMITIES. **A. David Gurewitsch, M.D.,** New York.

2:00 - 2:50 P.M. GAIT TRAINING FOR THE HEMIPLEGIC. **Mieczyslaw Peszczynski, M.D.,** Cleveland.

3:00 - 3:50 P.M. PROSPECTS FOR THE HEMIPLEGIC ARM. **Edward E. Gordon, M.D.,** New York.

4:00 - 4:50 P.M. PRACTICAL MANAGEMENT OF APHASIA. **Hildred Schuell, Ph.D.,** Minneapolis.

Wednesday, September 8

8:00 - 8:50 A.M. ACTIVITIES OF DAILY LIVING FOR THE HEMIPLEGIC PATIENT INCLUDING SELF-HELP DEVICES. **Donald A. Covalt, M.D.,** New York.

9:00 - 9:50 A.M. VOCATIONAL PROSPECTS FOR THE HEMIPLEGIC. **James F. Garrett, Ph.D.,** Washington, D.C.

PAINFUL LOW BACK

Tuesday, September 7

9:00 - 9:50 A.M. FUNCTIONAL ANATOMY OF THE SPINE. **Othmar Solnitzky, M.D.,** Washington, D.C.

10:00 - 10:50 A.M. MANAGEMENT OF ACUTE LOW BACK PAIN WITHOUT RADICULAR PATHOLOGY. **Hans Kraus, M.D.,** New York.

11:00 - 11:50 A.M. MANIPULATIVE TECHNICS OF THE SPINE AND INDICATIONS FOR USE. **John McM. Mennell, M.B.,** Richmond, Va.

2:00 - 2:50 P.M. BACK BRACES. **Odon F. von Werssowetz, M.D.,** Gonzales, Texas.

3:00 - 3:50 P.M. DIAGNOSIS AND INDICATIONS FOR SURGERY IN DISC DISEASE. **Edward B. Schlesinger, M.D.,** New York.

4:00 - 4:50 P.M. BACK PAIN AND DISABILITY AS A COMPENSATION PROBLEM. **Robert B. O'Connor, M.D.,** Boston.

OSTEOARTHRITIS

Wednesday, September 8

8:00 - 8:50 A.M. PATHOGENESIS AND MEDICAL MANAGEMENT. **Walter M. Solomon, M.D.,** Cleveland.

9:00 - 9:50 A.M. THERAPY IN PHYSICAL MEDICINE. **Arthur L. Watkins, M.D.,** Boston.

Note: The Committee on Advances in Education of the American Congress of Physical Medicine and Rehabilitation is in charge of the instruction seminar. It is purposely planned to limit the subjects this year to three which will be covered in considerable detail both from clinical and basic science points of view. It is normally planned that the larger and more important subjects will be repeated every three to five years.

Courses are offered as previously in two separate groups. However, as a trial this year, the distinction has been eliminated between the basic science group and the clinical group. Each group, and in many cases each lecture, will deal with basic science as well as clinical aspects. Physicians as well as physical therapists who are registered with the American Registry of Physical Therapists will be permitted to register for these courses. Members in good standing of the American Occupational Therapy Association are also eligible to enroll for the seminar.

The schedule of the seminar, as arranged, will permit attendance at both the course and scientific sessions.

Each registrant for the course is allowed the choice of one lecture during a period. The charge for the complete schedule of eight lectures is $15.00. Fewer than eight lectures may be scheduled at $2.00 per lecture. The right is reserved to reject any application if the Committee finds it desirable to do so. Registration for specific courses cannot be guaranteed when quotas are filled.

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